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Research Triangle Park, N. C. 27711

AIR POLLUTION ABSTRACTS

VOLUME 6, NO. 2

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**Prepared by
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711**

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Author Index	AI-1
Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.	

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

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As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching —more than those included in the subject index in each issue.

Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

Feedback from our users, including suggestions of articles, are always welcome.

APTIC Publications

- Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts*, June 1973, GPO No. EP 4.9:126, \$0.65.
- Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts*, June 1973 GPO No. EP 4.9:125, \$0.70.
- Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts*, March 1973, GPO No. EP 4.9:121, \$2.35.
- Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts*, June 1973, GPO No. EP 4.9:119, \$0.90.
- Mercury and Air Pollution: A Bibliography with Abstracts*, October 1972, GPO No. EP 4.9:114, \$1.25.
- Odors and Air Pollution: A Bibliography with Abstracts*, October 1972, GPO No. EP 4.9:113, \$3.00.
- Air Pollution Aspects of Emission Sources: Petroleum Refineries - A Bibliography With Abstracts*, July 1972, GPO No. EP 4.9:110, \$1.25.
- Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts*, May 1972, GPO No. EP 4.9:107, \$1.00.
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- Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:96, \$2.25.
- Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:95, \$0.50.
- Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:94, \$0.65.
- Air Pollution Aspects of Emission Sources: Nitric Acid Manufacturing - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:93, \$0.45.
- Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:92, \$1.00.
- Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes)*, March 1971, GPO No. EP 4.9:88, \$6.25.
- Beryllium and Air Pollution: An Annotated Bibliography*, February 1971, GPO No. EP 4.9:83, \$0.40.
- Asbestos and Air Pollution: An Annotated Bibliography*, February 1971, GPO No. EP 4.9:82, \$0.50.
- Municipal Incineration: A Review of Literature*, June 1971, GPO No. EP 4.9:79, \$1.00.
- Hydrocarbons and Air Pollution: An Annotated Bibliography (2 Volumes)*, October 1970, GPO No. HE 20.1309:75, \$5.00.

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Durham Contract Operations Contracts Management Division, EPA

- Contract No. 68-02-1379, Task Order No. 4 \$30,293**
DETERMINE THE FEASIBILITY OF MODIFYING THE EMISSION INVENTORY
SYSTEM (EIS) TO ACCEPT DATA FROM THE PENNSYLVANIA AIR QUALITY
AND NOISE EMISSION INVENTORY.
International Business Machines, Inc., Federal Systems Division, Federal Systems Center,
18100 Frederick Pike, Gaithersburg, Maryland 20760
- Contract No. 68-02-1760, RFP No. Du-75-B010 \$100,614**
OCCUPATIONAL AND ENVIRONMENTAL PESTICIDE EXPOSURE STUDY IN
SOUTH FLORIDA.
University of Miami, Dept. of Epidemiology and Public Health, School of Medicine, P. O.
Box 520875, Biscayne Annex, Miami, Florida 33152
- Contract No. 68-02-1385, Task Order No. 12 \$74,004**
REVIEWS OF SIP'S - REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMEN-
TAL COORDINATION ACT OF 1974 (ESECA).
TRW, Inc., Transportation & Environmental Operations, One Space Park, Redondo Beach,
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- Contract No. 68-02-1761, RFP No. Du-75-B030 \$32,983**
BIOMEDICAL AND ENVIRONMENTAL ENGINEERING DESIGN, FABRICATION AND
SUPPORT.
Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709
- Contract No. 68-02-1867, RFP No. Du-75-A093 \$316,000**
ADVISORY SERVICES ON SCALE-UP OF AIR POLLUTION CONTROL PROCESSES.
National Academy of Sciences, 2101 Constitution Avenue, Washington, D. D. 20418
- Contract No. 68-02-1484, Modification No. 2 \$45,412**
MODELING OF AIR QUALITY IMPACT OF SELECTED POWER PLANTS.
Walden Research, Division of Abcor, Inc., 201 Vassar Street, Cambridge, Massachusetts
02139
- Contract No. 68-02-1762, RFP No. Du-75-B017 \$102,957**
STUDY OF NEUROBEHAVIORAL EFFECTS OF OZONE (O3) ON HUMANS.
The Board of Trustees of the Leland Stanford Junior University, c/o Sponsored Projects Of-
fice, Old Pavilion, Stanford, California 94305

Contract No. 68-02-1764, RFP No. Du-75-B029 \$389,472
CHESS DATA PROCESSING SUPPORT.
 Sperry Univac, P. O. Box 3525, St. Paul, Minnesota 55165 (NOTE: Contract contains options
 in the amount of \$1,019,344)

Contract No. 68-02-1975, RFP No. Du-75-C100 \$28,244.04
PALLET RACKS AND ACCESSORIES.
 UNARCO Industries, Inc., Sturdi-Bilt Division, 12022 Parklawn Drive, Rockville, Maryland
 20852

Contract No. 68-02-1386, Task Order No. 11 \$35,000
COMPILATION OF AEROS STATE ASSISTANCE REPORTS.
 Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709

Contract No. 68-02-1861, RFP No. Du-74-X068 \$203,700
FABRICATION OF EXPERIMENTAL MULTI-BURNER FURNACE.
 Acurex Corporation, Aerotherm Division, 485 Clyde Avenue, Mountain View, California
 94042

Contract No. 68-02-0759, Modification No. 7 \$1,400,000
**MAINTENANCE AND CALIBRATION SERVICES TO SUPPORT THE COMMUNITY
 HEALTH AND ENVIRONMENTAL SURVEILLANCE SYSTEM (CHESS).**
 Rockwell International Corporation, Science Center, 1049 Camino Dos Rios, Thousand Oaks,
 California 91366

Contract No. 68-02-1946, RFP No. Du-75-C060 \$113,621
OPTICAL MARK READER SYSTEM.
 National Computer Systems, 4401 West 76th Street, Minneapolis, Minnesota 55435

Contract No. 68-02-1010, Modification No. 3 \$249,700
**STUDY OF DISPOSAL OF BY-PRODUCTS FROM NON-REGENERABLE FLU GAS
 DESULFURIZATION SYSTEMS.**
 The Aerospace Corporation, P. O. Box 95085, Los Angeles, California 90045

Contract No. 68-02-1765, RFP No. Du-74-B049 \$50,000
**REACTOR USE, OVERLOAD TECHNICAL ASSISTANCE AND SERVICE AND SUP-
 PLIES.**
 North Carolina State University, Nuclear Engineering Dept., Raleigh, North Carolina 27607

Contract No. 68-02-1386, Task Order No. 12 \$35,000
**DEVELOP AMBIENT AIR MONITORING SYSTEM SPECIFICATIONS FOR EXPAN-
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 (PAQSS).**
 Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere. Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1974

44140

APTIC NO. 67599

Abrigeon, E., P. Isoard, J. Jacq, G. Dumarchay, and R. Fontanges

APPLICATION OF MULTIVARIANT MODELS FOR THE ESTIMATION OF AIR POLLUTION FACTORS.

(Application des modeles multivariés a l'estimation des facteurs de pollution atmosphérique). Text in French. *Polut. Atmos. (Paris)*, 16(62):161-163, April-June 1974. 12 refs.

A multivariant model for the correlation analysis of sulfur dioxide and black smoke monitoring data collected by means of a monitoring network in Lyon in 1969, 1970, and 1971 and the results obtained are presented. Taxonomic and factorial analyses were performed to determine the sites with the highest position and the correlations between different variables and the parameters measured. The pollution levels were highest during winter and in the central section of the city, and lowest during the summer period and in the peripheral and suburban areas. However, the extension of the most polluted central area varied from one year to another.

44141

APTIC NO. 67598

Biswas, Asit K.

ENERGY AND THE ENVIRONMENT. *Water Power (London)*, 26(10):131, 344, Oct. 1974. 6 refs.

The major potential long-term environmental hazards from present and anticipated developments and consumption practices are discussed. They are: thermal pollution (including possible climatic changes due to constantly increasing levels of heat fluxes, carbon dioxide, and particulates) and problems of managing highly radioactive nuclear works. Environmental problems are also caused by rapid deforestation in developing countries because of their heavy dependence on wood as the main source of fuels.

44142

APTIC NO. 63764

Brushwell, W.

REQUIREMENTS OF ENVIRONMENTAL PROTECTION IN THE PAINT INDUSTRY. (Umweltschutzforderungen an die Lackindustrie). Text in German. *Farbe Lack*, 80(4):316-318, 1974. 31 refs.

Papers dealing with the problems of lead and mercury in paints, air and water pollution, and air pollution prevention in the paint industry and in finishing technologies in the USA are reviewed. The implementation of the Los Angeles Rule 66 has resulted in a reduction of the proportion of smog-forming solvents by over 90%. The standards on solvent emissions and solvent vapor concentrations in the air, as adopted in other states of the USA, differ from the California standards in view of the differences in climate. In finishing technology, substantial reduction of the solvent expenditure has been achieved by the use of water-dispersed acrylates.

44643

APTIC NO. 67677

Cobas, L. E.

SELENIUM: A REVIEW. *J. Ass. Pub. Anal.*, 12(3):68-72, Sept. 1974. 26 refs.

The uses, sources, and emissions of selenium and selenium compounds are reviewed. Chronic poisoning can occur in animals in the form of blind staggers, which is characterized by loss of hair, hooves, nails, and teeth, and a particular kind of paralysis. A survey of families in a seleniferous area showed selenium poisoning. In industries where selenium compounds are used, the atmospheric concentration should be below 1.0 mg/cu m of air. The threshold limit for hydrogen selenide is 0.2 mg/cu m of air. The threshold of toxicity to animals and probably man is 3-4 ppm in the diet. The selenium content of foods, effects of selenium on nutrition, and toxic effects are reviewed. The methods for the determination of selenium in biological structures are also described.

44344

APTIC NO. 67658

Condens, W. B.

THE ECOLOGY OF COIL COATING. *Metal Finishing*, 72(11):55-64, Nov. 1974. 28 refs.

The environmental problems of coil coating are reviewed. Emissions for the exhaust stacks into the atmosphere from a coil coating line range from 26-823 lbs/hr. Emission factors depend on the metal strip width, the metal gauge, the line speed, the type of coating, and the temperature. Two coil coating lines within the same plant without control equipment were surveyed for emissions of pollutants. The emission factors were 1.0 lbs/lb of coating volatiles applied of hydrocarbons, 1.10 lbs/MCF gas consumed of carbon monoxide, 0.20 lbs/MCF gas consumed of nitrogen oxides, 0.020 lbs/lb coating volatiles applied if a water quench is used of aldehydes, and 0.027 lbs/lb coating volatiles applied if an air quench is used of aldehydes. Various processes were the sources of pollutants, and adjustments were made which sometimes reduced pollution. Quantities of various pollutants discharged by each plant and air quality in the area of the plant were studied in a second phase of the survey. The third phase studied a catalytic incinerator and two thermal incinerators, which were the best methods of abatement equipment. Other aspects of pollution in the coil coatings industry are described including the effects of the energy crisis, redesign of the air carrying systems to recover heat, increased use of water-based coatings, water pollution, solid wastes, and compliance with Federal regulations.

44145

APTIC NO. 67551

Csorba, Tamas

DETERMINATION OF THE FLUE GAS LOSS DURING THE COMBUSTION OF HEATING OILS. (A füstgázvesztés meghatározása tüzelőolajok eltüzelésénél). Text in Hungarian. *Energiagazdálkodás*, 15(8): 369-370, Aug. 1974. 2 refs.

Formulae for the correct and approximate determination of the heat loss of oil-firing equipment, composed of the flue gas enthalpy and the chemically bound energy in the flue gas components, are presented. The heat loss due to the enthalpy of the flue gases is largely determined by the carbon dioxide and carbon monoxide content, while the contribution by hydrogen, hydrocarbons, sulfur dioxide, soot, and water vapor is negli-

ble. Similar considerations apply to the determination of the heat loss due to the chemically bound energy escaping the firing equipment with the flue gases. A simplified approximate formula can be applied to well-adjusted firing equipment in which no CO is generated, which facilitates the determination of the heat loss conditioned by the flue gas enthalpy.

44145

APTIC NO. 67938

Dzhandosov, S. U.

DEVELOPMENT OF THE FORCES OF PRODUCTION OF THE REPUBLIC AND ENVIRONMENTAL PROTECTION. (*Razvitiye proizvoditel'nykh sil Respubliki i okhrana prirody*). Text in Russian. *Vestn. Akad. Nauk Kaz. SSR*, no. 8:21-24, 1974.

The projected industrial development of the Kazakh Soviet Socialist Republic, USSR, is outlined along with the current and expected environmental problems as derived from economic growth. The new economic plan being developed for the period up to 1990 includes the aspects of resource management and environmental protection. Metallurgical plants in Kazakhstan are responsible for emissions of sulfur dioxide, dust, and carbon monoxide, while non-ferrous metallurgical plants also emit chlorine, copper, lead, zinc, and other valuable metals. Here, emission control is associated with the recovery of valuable materials. Most of the new industrial plants will be built in small and medium-size towns to alleviate the pollution load in big cities.

44147

APTIC NO. 67913

Eccleston, A. J., N. K. King, and D. R. Packham

THE SCATTERING COEFFICIENT AND MASS CONCENTRATION OF SMOKE FROM SOME AUSTRALIAN FOREST FIRES. *J. Air Pollution Control Assoc.*, 24(11):1047-1050, Nov. 1974. 11 refs.

Smoke from large scale fuel reduction fires in Western Australia was investigated from an aircraft. The fires were typically 10,000-20,000 acres in area with fuel loadings of 3-6 tons/acre. Measurements were made of mass concentration, scattering coefficient, and total particulate production in the smoke. An electrostatic precipitator was used to collect smoke particles, and a continuously recording nephelometer was used to measure scattering coefficients in the smoke columns. The results suggested that the mass concentration (g/cu m) was equal to 0.24 times the scattering coefficient (/m). About 1.8% of the fuel appeared as particulate matter in the air above the fire. (Author abstract modified)

44148

APTIC NO. 70028

Eedy, Wilson

ENVIRONMENTAL CAUSE/EFFECT PHENOMENA RELATING TO TECHNOLOGICAL DEVELOPMENT IN THE CANADIAN ARCTIC. *National Research Council of Canada, Ottawa, Environmental Secretariat, Publication NRCC 13688*, 136p., April 1974. 428 refs.

The environmental cause/effect interrelationships observed as a consequence of man-mediated disruptions in Canadian Arctic regions are summarized. Sulfur dioxide pollution has destroyed vegetation in Southern Canada. Lichens are particularly vulnerable and have no defense mechanism against pollutants. In Fairbanks, ice fogs and stagnant air collect very high concentrations of pollutants, with the worst conditions arising from fossil fuel combustion and vehicle exhaust. In Yellowknife (Mackenzie) thermal inversions cause high local deposition of arsenic arising from smelter fumes. Concentrations are reported as high as 3 ppm. Fogs cause problems in the Edmonton (Alberta) air. Stable smoke clouds drifted north from a southern forest fire and reduced the solar radiation by 25%. Similar problems can occur with the plumes of industrial or thermoelectric stacks.

44149

APTIC NO. 67939

Fedorova, G. G., I. N. Sidorov, and K. M. Afanas'ev

DISPERSION OF COAL IN GAS UNDER THE ACTION OF PHYSICO-CHEMICAL PROCESSES, AND MEASURES FOR DUST ABATEMENT. (*Dispersiia uglya v gazovoy srede pod vozdeystviem fiziko-khimicheskikh protsessov i меры пылеподавления*). Text in Russian. *Fiz.-Tekh. Probl. Razrab. Polez. Iskop.*, no. 4:121-126, 1974. 9 refs.

The disintegration and softening of coal in gaseous atmosphere was studied with respect to dust formation and dust abatement in mines and in other operations. In a fraction of 2-3 mm, the rate of disintegration, measured after storage for 3 years under atmospheric conditions, was determined essentially by the strength and regularity of the shape of the particles, and values ranging from 73.6% to 30.2% were measured. Anthracites and soft coals soften and disintegrate under 40 atm pressure in carbon dioxide atmosphere. Repeated saturation of coal samples with destroyed structure showed embrittlement of the surface layer and flaking. Such coals generate considerable dust emission during mining. During coal mining, the rate of dust formation can be abated by wetting the coal, and especially by the injection of water jets.

44150

APTIC NO. 67940

Galantai, Pal

STATE OF ART, AND CURRENT TASKS AND PROBLEMS OF ENVIRONMENTAL PROTECTION IN KOMAROM COUNTY (HUNGARY). (*A környezeti-vedelem helyzete, idoszeru kerdesei, feladatai, Komarom megyeben*). Text in Hungarian. *Tatabányai Szénbányászati Műszaki-Közgazdasági Kozl.*, no. 2-3:55-60, April-Sept. 1974.

The state of the art of environmental pollution, as well as current achievements and tasks in environmental protection in Komarom county, the most industrialized area in Hungary, are presented. While being one of the most polluted counties in Hungary, Komarom county is in an advanced position in environmental protection, and the measures currently taken are preventive rather than reparative in nature. Dust, sulfur dioxide, fluorine, and malodorous emissions are principally responsible for air pollution. Thermal power plants, cement works, alumina factories, mines, and a vitamin B12 fermenting plant are the chief sources of pollution. A large-capacity cement work is being equipped with electrostatic precipitators for dust emission control. The malodorous substances generated in the vitamin B12 fermenting plant will be destroyed by incineration.

44151

APTIC NO. 67637

Grennfelt, P. and T. Lindvall

A SENSORY AND PHYSICAL-CHEMICAL SURVEY OF ODOROUS EFFLUENTS FROM A KRAFT PULP MILL. *Svensk Papperstidn.*, Stockholm, 77(15):563-568, Oct. 1974. 15 refs.

The applicability of sensory and physical-chemical methods in the monitoring of odorous effluents from pulp mills was studied at the source. By use of a mobile odor laboratory, the odor strength of the pulp mill effluents was estimated with a threshold technique and a psychological scaling method. Reduced sulfur compounds were measured by gas chromatographic separation and flame photometric analysis. Great differences in odor strength were found between emission sources. Beside the main flue stack, other important odor contributors were the lime kilns, the odor destruction system, and ventilation exhaust. A satisfactory correlation between the odor strength of the gases and their chemical composition could only be found in a few cases. (Author abstract modified)

44152

APTIC NO. 67634

Hara, Zenshiro

HEAVY METALS POLLUTION DUE TO ZINC-SMELTERY FUMES. (*Aenseirensyo haen ni yoru jukinzoku*

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osen). Text in Japanese. *Seisan Kenkyu (Prod. Res.)*, 26(4):145-147, April 1974.

The amounts of cadmium lost in the zinc smelting process were determined by monitoring the amounts of Cd going into the process, and that coming out. The plant under observation was Toho Zinc, Yamaguchi Smelter. The numerical results, calculated from data provided by the smelter, were inconclusive. For determining concentrations of Zn, lead, and Cd in residences about 500 m from the smelting plant chimney dust samples were collected from attic beams and from the Braun tube in television sets. Outdoor deposit cages were not used for fear that exposure of dust to rain and dew would change the composition and form of the pollution materials. In the 10 samples taken, the concentration of Cd ranged from 200-980 ppm; Zn, 1.1-6.7%; and Pb, 0.2-1.2%. Electron microscope pictures showed that the dust particles were below 50 micron in size. Zinc existed as distinct particles, but Cd was present as a very fine particulate deposit.

44153

APTIC NO. 67941

Horvath, Sándor

ENVIRONMENTAL PROBLEMS IN CEMENT WORKS.

(A környezetvédelmi problémák a cementgyártásban). Text in Hungarian. *Társadalmi Szemle* (Social Review), 1974, 7 refs.

Problems of air pollution in cement works in Hungary are described. Sulfur dioxide, coal dust, and occasionally carbon monoxide are generated by powdered-coal fired clinker kilns. Coal dust is also released by hammer mills used for milling coal. However, the wet type rotary kilns used and the cement mills are chiefly responsible for dust emissions which amount to 7% of the cement production. Multicyclones, bag filters, and electrostatic precipitators are suitable for dust separation from the blow air of cement mills. The waste gases from the coal drier are cleaned by means of multicyclones. A horizontal type electrostatic precipitator has been installed at a rotary clinker kiln for dust separation. The air flow rate through the separator is set at 0.7 m/sec. The collector electrodes can be knocked off 4 to 60 times an hour.

44154

APTIC NO. 67990

Kanaya, Nobuyuki

ALKYL CYCLOHEXANE SOLVENTS. (*Arukiru shikuro kakisano yoru*). Text in Japanese. *Sekiyu Gakkaishi (J. Japan Petroleum Inst. (Tokyo))*, 17(9):77-80, Sept. 1974. 10 refs.

The total quantity of hydrocarbon emission in Tokyo in 1972 was 219,474 tons, and more than half was attributable to the automotive exhaust emission, while 25% was attributable to organic solvents. The figure on organic solvents includes only the emissions from the paint industry and excludes the solvent used in dry cleaning, printing ink and agricultural chemicals. The solvents can be classified into photochemically reactive solvent and non-photochemically reactive solvent. The former includes olefins and aromatic HC, while the latter includes cyclohexane-type and paraffin-type solvents. The most commonly used solvents in the paint industry are aromatic HCs such as toluene and xylene with high photochemical reactivity. As replacement for such solvents, C₆H₁₂ and paraffin-type solvents are noteworthy. Paraffin-type solvents are unsuitable except in special cases due to their low solubility. The solvent with great potentiality for replacing C₆H₅CH₃ and C₆H₄(CH₃)₂ are methylcyclohexane and ethylcyclohexane. The data on the solubility of various resins in C₆H₁₁CH₃ and C₆H₁₁C₂H₅ are given. Aspects of solvent control standards are discussed in reference to the Los Angeles Rule 65.

44155

APTIC NO. 67642

Karr, C., Jr., F. Waldstein, and J. J. Kovach

COMPOSITION OF FLY ASH FROM A COAL-FIRED MHD GENERATOR WITH POTASH SEED. *J. Inst. Fuel*, 47(392):177-180, Sept. 1974. 6 refs.

A fly ash from a magnetohydrodynamics (MHD) coal combustor with potassium carbonate seed (as potassium oxide) was fractionated by flotation, extended aqueous extraction, and selection of individual particles under the microscope, followed by infrared and laser-Raman spectroscopy. A similar examination was made of the ash after reduction with hydrogen and steam at 850 C. In both samples, the production of the mineral kaolinite (KAISO₄) from the reaction of potassium oxide with aluminosilicates was largely responsible for the water-insoluble potassium. In the reduced sample, the K₂O released from the potassium sulfate in the original ash resulted in a greatly increased yield of kaolinite. Potassium sulfate, potassium bicarbonate, and potassium nitrate in the original ash were produced by the reaction of K₂O with sulfur oxides, water plus carbon dioxide, and nitrogen oxides, respectively. (Author abstract)

44156

APTIC NO. 67577

Kubota, Torahide

POLLUTION CONTROL MEASURES FOR METAL FINISHING INDUSTRY (NO. 1). (*Toso kogyo no kogi boshi taisaku*). Text in Japanese. *Kinzoku Hyomen Gijutsu (J. Metal Finish.)*, no. 6:47-50, 1974.

The previous method of dilution and dispersion of pollutants from the painting and coating industry is no longer the answer for pollution control, because the solvent molecular accumulation will eventually saturate the limited air environment and cause complex chemical reactions, producing peroxyacetyl nitrate, acrolein, aldehydes and even other unknown pollutants. In Japan, the coating industries are usually operated on small or medium scales. Small plants handling small coating articles are operating in the midst of residences of busy downtown areas and are constant sources of complaints. The complaints against paint coating mists soiling laundry and walls of buildings have gradually subsided since the appearance of scrub booths, though the noise of the scrub booths has created new types of complaints. These can be eventually solved by the change of direction or location of these operations, and the use of insulation material for buildings. But the problem of odor from synthetic resin coating materials is still very prevalent. In addition, the combination of different types of chemicals, such as the mixture of phenol from phenol resin coating and chlorine from water can be extremely unpleasant.

44157

APTIC NO. 67623

Nakaoka, Tadao

DEODORIZATION BY OZONE. (*Ozon niyoru dasshu*). Text in Japanese. *Yosui to Haisui (J. Water Waste)*, 16(8):863-872, Aug. 1974.

The Inba marsh, located in the northern section of Chiba Prefecture, Japan, is the source of water for the surrounding regions. It is also the recipient of liquid waste from the surrounding regions, and as such, gives rise to offensive, moldy odors periodically in the faucet water. The complaints of bad odor accompany rises in the plankton level of the marshlands. By treating the water with activated charcoal and ozone, the odor problem was eliminated. The charcoal-ozone treatment was carried out in addition to the usual chlorination, precipitation, and sand filtration processes. A schematic diagram of the water purification plant, and a map showing the locations and concentrations of different contaminants found in the Inba marshwaters in 1972 are included in the report.

44158

APTIC NO. 67686

Nishikawa, Kazuyuki

BAD ODOR OF POUNDRIES. (*Chuzo kozo no akusaku ni tsuite*). Text in Japanese. *Japan Environmental Health Center, Proc. Conf. Environ. Health*, 18th, Fukuji, Japan, 1974, p. 85-86. (Oct. 3-4.)

The malodor sources and odor concentration in foundries with a monthly production capacity of 1000 tons were investigated.

The odor concentration, emission quantity, and O.E.R. measured at the shell molding process, oil core process, greensand molding line, and cupola are given. The malodorants emitted in the greensand molding line are produced by the pyrolysis of additives such as lime, pitch, grain, power, starch, and thierac, and some of the malodorants identified are ethylene, benzene, toluene, xylene, phenol, formaldehyde, and styrene. In this case, the odor is a burning odor without irritating effect. In the shell molding process, the malodorants such as C_6H_5OH , $HCHO$, and ammonia are produced by the pyrolysis of thermosetting phenol resin. The odor is strongly irritating due to its high NH_3 content. In the oil core process using lined oil, the odor is extremely irritating due to its high acrolein content.

44159

APTIC NO. 67579

Omotehara, Yasuo, Yasuo Fukumura, Hiroshi Tomoto, Kaoru Sato, Fumio Tsujimoto, Isao Nagaishi, and Tadahiho Azuma
A STUDY OF THE REDUCTION OF NITROGEN OXIDES EMITTED FROM THE COMBUSTOR (1ST REPORT). NOX FORMATION IN OIL BURNER. (Nensho sochi no okeru chisso sankabutsu teigensha no kenkyu (daiippo) (Yubana ni okeru NO_x no seisai). Text in Japanese. Osaka Furitsu Kogyo Gijutsu Kenkyusho Hokoku (Osaka Prefect. Res. Inst. Ind. Technol. Rep.), no. 63:14-17, July 1974. 1 ref.

The measurement and analysis of nitrogen oxides formation by combustion in an oil burner are described. The concentration of NO_x in flue gas for various air ratios had a convex pattern. The maximum concentration was at air ratio of 1.15 to 1.20. There was a similar tendency with the flue gas temperatures. The formation of NO_x is promoted by an increase of the flow rate of fuel. Based on the controlled potential electrolysis method, the NO_x analyzer cannot be utilized when the gas contains unburned components such as carbon monoxide and hydrocarbons.

44160

APTIC NO. 67580

Omotehara, Yasuo, Yasuo Fukumura, Hiroshi Tomoto, Kaoru Sato, Fumio Tsujimoto, Isao Nagaishi, and Tadahiho Azuma
A STUDY OF THE REDUCTION OF NITROGEN OXIDES EMITTED FROM THE COMBUSTOR (2ND REPORT). CONCENTRATION PROFILE OF NO_x IN OIL BURNER FLAME. (Nensho sochi no okeru chisso sankabutsu teigensha no kenkyu (daiipo) (Yubana ni okeru kaenai no NO_x bunpu). Text in Japanese. Osaka Furitsu Kogyo Gijutsu Kenkyusho Hokoku (Osaka Prefect. Res. Inst. Ind. Technol. Rep.), no. 63:18-23, July 1974. 3 refs.

The reaction kinetics of the nitric oxide formation based on the Zeldovich mechanisms were investigated. Gas from the gas type oil burner flame was analyzed. The rate of formation of NO is seriously affected by the flame temperature. The concentration profile of NO_x exactly corresponded to the flame temperature, but the oxygen concentration profile differs slightly with it. The NO_x formation can be controlled by keeping the flame temperature low, rather than by reducing the O_2 density in the flame.

44161

APTIC NO. 67567

Oriolani, Carlo, Roberto Carlevaro, and Fausto Gamma
MOTORCYCLES EXHAUST EMISSIONS CHARACTERISTICS. (Analisi delle emissioni allo scarico dei motocicli). Text in Italian. Termotecnica (Milan), 28(6):309-313, 1974. 4 refs.

The behavior of several motorcycles was examined with respect to the carbon monoxide, hydrocarbon, and nitrogen oxide emissions in the European Cycle WP-29 dynamometer tests. The CO emissions from the different motorcycles showed little variation, with a mean value of 140 g/cycle. The unburnt hydrocarbon emissions ranged from 2.9 to 6.65 g/cycle, averaging 4.9 g/cycle. The findings indicate the priority of the control of the CO emissions which is possible by modification of the fuel system to achieve air-excess coefficients close to

or slightly below the stoichiometric level. The use of lean mixtures results in a considerable reduction of the CO emission and an increase of the total nitrogen oxide emission.

44162

APTIC NO. 67811

Pervior, J. W., R. C. Barley, D. E. Field, B. M. Friedman, R. B. Morris, and W. A. Schwartz

SURVEY REPORTS ON ATMOSPHERIC EMISSIONS FROM THE PETROCHEMICAL INDUSTRY, VOLUME IV (FINAL REPORT). Air Products and Chemicals, Inc., Marcus Hook, Pa., Houdry Div., Office of Air and Water Programs Contract 68-02-0255, EPA-490/3-73-005-d, 272p., April 1974.

Air pollution by the petrochemical industry was studied to provide data that can be used in the fulfillment of Environmental Protection Agency obligations under the terms of the Clean Air Amendments of 1970. The petrochemicals included are classified as large production, high growth rate, or significant air pollutants. A total of 33 distinctly different processes which are used to produce 27 petrochemicals were surveyed. The results are reported in four volumes. This volume covers the following processes: polypropylene, polystyrene, polyvinyl chloride, styrene, styrene-butadiene rubber, vinyl acetate via acetylene, vinyl acetate via ethylene, and vinyl chloride. The following information is included for each process: a process description, a process emission inventory, a catalog of emission control equipment, a list of producers, and an evaluation of the significance of the air pollution from the process. A summary of emissions to the atmosphere from all the processes studied is tabulated. (Author abstract modified)

44163

APTIC NO. 67943

Puchner, Ferenc

AIR POLLUTION PROBLEMS OF DOROG, HUNGARY. (Dorog levegőszennyezési problémái). Text in Hungarian. Tatabányai Szénbányák Műszaki-Korlátozandási Kozl., no. 2-3:74-76, April-Sept. 1974.

An inventory is presented of industrial emission in an industrialized town in Hungary, and existing or planned emission control techniques are described. A power plant with a 76 m high stack is responsible for considerable emissions of fly ash, soot, and flue gases. The sulfur dioxide emissions from cement works could be reduced by reducing the sulfur content in the heavy fuel oil currently used from 3%. Dust emissions in the cement works are controlled by means of wet type separators and multicyclones. The malodorous emissions of the vitamin B12 fermenting unit of a pharmaceutical plant contain methane, hydrogen sulfide, ammonia, amino acids, indols, skatole, and mercaptans. These emissions are currently released through a 13 m high stack, while emission control by foam scrubbing and incineration in blow torches is envisaged. Unidentified malodorous emissions from the vitamin B12 spray-drying unit will be deodorized by catalytic oxidation. Quantitative separation of unknown malodorous substances released from a drier with pyridone carboxylic acid was achieved by the use of a scrubber.

44164

APTIC NO. 67439

Sandberg, Gary R. and Ingrid K. Allen

A PROPOSED ARSENIC CYCLE IN AN AGRONOMIC ECOSYSTEM. Preprint, American Chemical Society, Washington, D. C., 25p., 1974. 81 refs. (Presented at the American Chemical Society Meeting, Atlantic City, N. J., Sept. 1974.)

An arsenic cycle model is proposed to give some perspective on the impact of organic arsenical herbicides in an agronomic ecosystem, with the primary redistribution mechanisms in the model being the reduction of arsenicals to methylarsines, soil erosion, and arsenic uptake. Transfers in the cycle include: application of arsenical herbicides, contamination of water with spray drift or volatilization, arsenic movements from treated vegetation to the soil, uptake of arsenic by vegetation, reduc-

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tion of organic arsenicals to volatile forms of arsenic (plant-air), arsenic losses with crop harvest, reduction of arsenicals to volatile forms of arsenic (soil-air), oxidation of methylarsines, arsenic input with irrigations, movement of arsenicals from treated soil to water, arsenic inputs with commercial fertilizers, and arsenic contamination from non-agricultural sources. The model assumes that 17-35% of the total input of arsenic to the soil is lost as methylarsines, with the loss being calculated as 1638-3282 g As/harvest/yr for cacodylic acid and 1018-2007 g As/harvest/yr for monosodium methanearsonate applications. The model indicates that arsenic is mobile and nonaccumulative in the air, plant, and water phases of the agronomic ecosystem. Arsenicals do accumulate in the soil, but redistribution mechanisms preclude hazardous accumulation at a given site.

44165

APTIC NO. 67720

Sims, Anker V.

FIELD SURVEILLANCE AND ENFORCEMENT GUIDE FOR PETROLEUM REFINERIES (FINAL REPORT).

Benn Holt Co., Pasadena, Calif., Environmental Protection Agency Contract 68-02-0645, EPA-450/3-74-042, 352p., July 1974. 30 refs.

NTIS: PB 236669/AS

A field surveillance and enforcement guide was prepared for use by air pollution control officers in petroleum refineries and natural gas processing plants. The processing facilities used by the petroleum and natural gas industries are described and air pollution sources identified. In general, pumps, compressors, heat exchangers, valves, and fittings emit air contaminants by leakage. Furnaces and heaters are a source of combustion pollutants. Relief valves are designed to release gases at certain pressures and represent a potential source of air pollution. Special air pollution problems associated with specific operations include sulfur oxide emissions from sulfur plants; particulates, carbon monoxide, and sulfur oxides from catalytic crackers and catalyst regeneration operations; hydrocarbon emissions from storage and loading facilities; and emissions from flares and blowdown systems. Equipment and strategy for monitoring air pollution sources are discussed. Sampling and source monitoring on a local and continuous basis is described. Instruments for determination of sulfur dioxide, nitrogen oxides, CO, hydrocarbons, and particulates are commercially available. Procedures for inspection and surveillance of refineries are presented. Qualification requirements for the field enforcement officers are discussed. (Author abstract modified)

44166

APTIC NO. 70025

Solomon, H. L. and S. Sokolsky

AN ECONOMIC ASSESSMENT OF STOL AIRCRAFT POTENTIAL INCLUDING TERMINAL AREA, ENVIRONMENTAL CONSIDERATIONS (VOLUME I FINAL REPORT). Aerospace Corp., El Segundo, Calif., National Aeronautics and Space Administration Contract NAS 2-6473, Rept. NASA CR-2424, 133p., May 1974. 30 refs.

NTIS: N-74-27497; GPO

The air pollution characteristics and impact of short haul air-line systems using short takeoff and landing (STOL) aircraft were determined. The rate of formation of hydrocarbons, carbon monoxide, and nitrogen oxides varies throughout the landing/takeoff cycle. A major portion of the CO and hydrocarbon emissions are created while the aircraft is taxiing and waiting for takeoff. Conventional takeoff and landing (CTOL) aircraft produce less emissions than STOL as long as its ground time before takeoff does not exceed that of STOL by more than 5-6 min. Aviation emissions produced for CTOL and STOL aircraft are charted for the California Corridor, Midwest Triangle, and Northeast Corridor. Aircraft emissions below 3000 ft were calculated at the airports and the surrounding regions. Carbon monoxide emissions in tons/day totaled 2666 in New York and 33 at JFK Airport; 1586 in Virginia-

Washington, D. C. and 35 at National Airport; and 10,137 at the Los Angeles Basin and 36 at Los Angeles International. Hydrocarbon emissions in tons/day totaled 756 in New York and 13 at the airport; 361 in Virginia-Washington and 5 at the airport; 2740 in the Los Angeles Basin and 14 at the airport. Nitrogen oxides in tons/day totaled 547 in New York, 2.5 at the airport; 175 in Virginia-Washington, 0.6 at the airport; and 750 in the Los Angeles Basin, 2.5 at the airport.

44167

APTIC NO. 67947

Wakamatsu, Seiji

AN ATTEMPT TOWARD A TOTAL ENERGY SYSTEM.

(*Totaru enerugi shisutemu he no shiko*). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 26(10):17-28, Oct., 1974.

Factors to be taken into consideration in establishing a total energy system include energy source, GNP, economy, dependability, safety, location, water pollution, and air pollution. In about 30 yr petroleum fuel as an energy source will be replaced by other sources, which are under intensive study. More funds are needed to finance the development of new techniques for new sources of energy. Environmental problems caused by air pollution can be eliminated should the new techniques be developed. However, pollution due to radioactive substances and heat is expected to increase. Radiation pollution can be prevented by countermeasure techniques but thermal pollution is more difficult to control.

44168

APTIC NO. 67494

Yoshida, K. and J. Maybank

ATMOSPHERIC GRAIN DUST CONTAMINATION IN THE VICINITY OF PRAIRIE GRAIN ELEVATORS. PART I. DUST FALL SURVEY. Saskatchewan Research Council, Saskatchewan (Canada), Physics Div., 55p., Aug. 1974. 40 refs.

Dust generated in grain elevators was sampled and analyzed using cascade impactors and midjet impingers followed by neutron activation analysis. The dust consisted of about 50% water insoluble material of 5 micron mass median diameter, with maximum sizes up to 50 micron. Trace mineral elements in the dust appeared to have originated as follows: aluminum and titanium from harvesting and grain handling equipment, manganese and vanadium from the soil or from combustion of fuel, and silver from pesticide residue on grain. The amount of dust fall in the two communities examined was 35-50% of the total dust generated by the grain elevators. Isopleths of dust deposition density in the two communities studied showed that the highest dust fall density (1.5-2.5 g/sq m/30 days) was produced by light southeast winds. The dispersion pattern of grain dust was delineated by a computer model of a Gaussian type dispersion and with modification of existing formulae to a mathematical model which was subsequently verified by its rough approximation to the dust fall data. (Author conclusions modified)

44169

APTIC NO. 67748

Office of Air and Waste Management, Research Triangle Park, N. C., Emission Standards and Engineering Div.

BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE: PHOSPHATE FERTILIZER INDUSTRY. VOLUME 2: TEST DATA SUMMARY (FINAL REPORT). Rept. EPA 450/2-74-019b, 62p., Oct. 1974. 33 refs.

NTIS: PB 237607/AS

Background information on the derivation of performance standards for the phosphate fertilizer industry is presented in connection with a first volume which provided a general description of the facilities for which standards were proposed. Summaries of emission testing data cited in Volume I are presented and are concerned principally with tests for fluorides and visible emissions. The facilities, characteristics of the exhaust gas streams, and conditions of operation are

also described. Types of facilities covered in the document include: wet-process phosphoric acid plants, superphosphoric acid plants, diammonium phosphate plants, run-of-pile triple superphosphate plants, granular triple superphosphate plants, and storage of granular triple superphosphate. Many of the tests summarized were conducted using the Environmental Protection Agency Method 13 which will be proposed in the Federal Register at or before the time of proposal of the performance standards.

1973

44170

APTIC NO. 67435

Anderson, M. Norman

NATIONAL NEED - AN INDUSTRY VIEW OF RESEARCH. *National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 709-725. 12 refs. (Aug. 8-10.)*

NTIS: CONF-730802

The New Lead Belt contained within the bounds of the Clark National Forest with private land intermingled is being mined by five mines and two smelters. Considerable attention was paid to environmental protection efforts. One smelter incorporated \$4.5 million in air pollution control equipment, 25% of the total capital allocated for the facility. When new growth on the top of trees downwind of the smelter started to discolor, a joint research effort was conducted between the lead company, the University of Missouri, and the U. S. Forest Service. The smelter emits approximately 11,000 tons/yr of sulfur to the atmosphere. Sulfur dioxide, water pH, soil, and vegetation were studied in the area. Excessive sulfur dioxide and trioxide and acid mist fumes from the smelter were the cause of the tree browning; a higher than background pattern of sulfur and lead were noted in the soil and vegetation immediately around the smelter. Additional control methods were instituted, a continuous SO₂ stack monitoring system was installed, and four permanent SO₂ ambient monitoring stations were installed in the area and a fifth station is planned. Control costs are discussed. A general discussion is given of ecology, pollution from smelters, and cooperative research efforts.

44171

APTIC NO. 67423

Bohner, M. H. and R. Carpenter

THE RATE OF MERCURY LOSS FROM CONTAMINATED ESTUARINE SEDIMENTS IN BELLINGHAM BAY, WASHINGTON. *National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 198-210. 18 refs. (Aug. 8-10.)*

NTIS: CONF-730802

An estimated 10-20 lbs of mercury were discharged daily from a chlor-alkali plant at the head of Bellingham Bay, in northern Puget Sound, between 1965 and 1970. Sediment cores collected periodically at the same stations from 1970 to 1973 showed that the level of Hg in the sediments decreased with time since the high discharge of mercury was stopped. The rate of Hg decrease followed first order kinetics, with a half-time of about 1.3 yr in sediments which were generally oxidizing, with 2-3% carbon, and which had initial Hg concentrations of 2-10 ppm. There are a few short-term laboratory experiments in the literature in which the evolution of methyl mercury or elemental Hg was measured under apparently similar conditions. The rates observed in the field in Bellingham Bay appeared to be two to ten times faster than the rates obtained in the laboratory experiments. The higher rates observed in the field samples may mean that other forms or processes are important in the loss of mercury. Suggested additional mechanisms are removal of volatile forms of mercury with bubbles released from the

sediment and/or sediment transport enhanced by benthic organisms and wave-induced currents which may resuspend sediment. Bubbles were observed evolving from areas of the Bay within 0.5 km of the chlor-alkali plant where the surface sediments are permanently anoxic. While the importance of gas bubbles in transporting Hg from the sediments was not determined, this method may be a source of air pollution. (Author abstract modified)

44172

APTIC NO. 67726

Cotwill, D. M. and A. J. Hickman

THE CONCENTRATION OF VOLATILE AND PARTICULATE LEAD COMPOUNDS IN THE ATMOSPHERE: MEASUREMENTS AT FOUR ROAD SITES. *Dept. of the Environment, Crowthorne (England), Transport and Road Research Lab., TRRL Rept. LR 545, 8p., 1973. 3 refs.*

Total lead pollution in the atmosphere was measured at four sites, two at fuel stations on heavily trafficked roads, one in an urban road tunnel, and one on a busy rural motorway. The values for both the particulate and the volatile lead compounds are reported. The contribution of the volatile materials to the total lead pollution was significant, comprising approximately 55 and 30% of the approximately 2 micrograms/cu m total at the filling stations and approximately 10% of the 15 micrograms/cu m and 10 micrograms/cu m average totals at the tunnel and motorway, respectively. Considerable variations were found in the data obtained at the tunnel and the motorway site. The average concentration of the volatile lead compounds found at the four sites was approximately 1 microgram/cu m, and the highest single value of 3.57 microgram/cu m was obtained at the heavily trafficked site. (Author abstract)

44173

APTIC NO. 67739

Davidson, D. L. and F. Domal

EMISSION MEASUREMENTS OF A J93 TURBOJET ENGINE (FINAL REPORT). *ARO Inc., Tullahoma, Tenn., Dept. of Transportation - Arnold Engineering Development Center Interagency Agreement DOT-AS-20024, Program Element 921K, AEDC-TR-73-132, ARO-ETF-TR-73-46, FAA-RD-73-66, 101p., Sept. 1973. 28 refs.*

NTIS: DDC: AD-766 648

Exhaust gas emission measurements were made at the nozzle of a J93 turbojet engine at simulated flight conditions from sea level static to Mach 2.0 at 75,000 ft and Mach 2.6 at 65,000 ft. Real time measurements of carbon monoxide, carbon dioxide, hydrocarbons, nitric oxide, and nitrogen oxides were taken over a range of afterburning and nonafterburning engine power settings using a gas sampling system designed to adhere to SAE ARP 1256 specifications. Nitric oxide and hydroxide were measured in situ by a narrow-line ultraviolet spectral absorption technique. Batch type measurements of particulates and other trace constituents of the exhaust gas were also made. Emissions vary significantly with combustor inlet pressure and temperature, and with Mach number and altitude. Nitrogen oxides increased with the square root of the combustor inlet pressure and the 2.5 power of the combustor inlet temperature. (Author abstract modified)

44174

APTIC NO. 67422

Dow, B. L. and K. J. Yost

CHARACTERIZING STEEL MILL DUST. *National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 185-196. (Aug. 8-10.)*

NTIS: CONF-730802

The nature of emissions from the pyrometallurgical processes associated with the steel industry were studied. The concentrations of cadmium, zinc, and lead in the emissions and the extent to which these metals tend to concentrate in different size

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ranges were studied. The possibility of identifying steel mill emission particles collected on high-volume filters was also investigated. If the emission from a source can be properly characterized, it should be possible to identify these emissions when they are found at some distance away from the source. A JSM-U3 scanning electron microscope equipped with an energy dispersive X-ray analysis system was used to characterize the steel mill emissions. Using the relative concentrations of iron, zinc, cadmium, lead, and manganese it was not only possible to identify the particles emitted from the steel mill, but in certain cases also possible to identify the steel mill process from which the particle originated. An Andersen stack sampling head was used to collect the particles and fraction them into different size ranges. (Author abstract modified)

44175

APTIC NO. 63430

Huebner, G. J., Jr. and D. J. Gasser

GENERAL FACTORS AFFECTING VEHICLE FUEL CONSUMPTION. Preprint, *Society of Automotive Engineers, Inc.*, New York, 6p., 1973. (Presented at the *Society of Automotive Engineers, National Automobile Engineering Meeting*, Detroit, Mich., May 15, 1973.)

The effect of emissions controls on vehicle fuel consumption is discussed. Fuel economy was measured under urban, freeway, and interstate cycle conditions. The loss to emission controls and related engine specification changes for an intermediate car with automatic transmission is presented. In the urban cycle from 1968-1973 there was a loss of 1.8 mpg or 15%; at 70 mph road load the loss was 0.5 mpg or 3%. The major losses occurred in the 1973 changes when exhaust recirculation and delays in spark advance timing were introduced. In the urban cycle for 1972-1973, the loss was 1.2 mpg or 10% and at 70 mph road load the loss was 0.4 mpg or 2%. Acceleration loss from 1972-1973 was 1%; 2% was due to gears and 3% to direct gear.

44176

APTIC NO. 67420

Jacko, Robert B.

INDUSTRIAL SOURCE SAMPLING FOR TRACE METALS. *National Science Foundation-Research Applied to National Needs*, Washington, D. C., *Environmental Aspects of Trace Contaminants Program*, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 146-164. (Aug. 8-10.)

NTIS: CONF-730802

An Environmental Protection Agency stack sampling train is described for the measurement of trace metals from a power plant, municipal incinerator, zinc smelter, and steel mill. The back-half of the train collected insignificant amounts of specific trace metals. A particle sizing sampling head fitted to the working end of the EPA stack probe indicated a segregation of trace metals toward the submicron particle size ranges. Over 50% by weight of the cadmium in some samples was in the submicron size range. A significant difference in the cadmium concentration was found in the material collected on the glass fiber filter as compared to the probe backwash. For relatively cool stacks (180-400 F), the cadmium concentration was from two to forty times greater in the material collected on the glass fiber filter; in a hot stack (1200 F), the reverse occurred by a factor of approximately two. Lead, nickel, zinc, and copper were also measured in the stack. (Author abstract modified)

44177

APTIC NO. 67421

Kaakinen, John W. and Roger M. Jorden

DETERMINATION OF A TRACE ELEMENT MASS BALANCE FOR A COAL-FIRED POWER PLANT. *National Science Foundation-Research Applied to National Needs*, Washington, D. C., *Environmental Aspects of Trace Contaminants Program*, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 165-184. 21 refs. (Aug. 8-10.)

NTIS: CONF-730802

A mass balance for 16 elements at a coal-fired power plant was determined. Samples were obtained from Unit No. 3 of the Valmont Power Plant located near Boulder which burns low-sulfur pulverized coal or natural gas and has a maximum power output of 180 megawatts. Particulate emissions are controlled by a mechanical collector followed by an electrostatic precipitator in parallel with a wet scrubber. Samples were collected during 3 days of scrubber/precipitator performance tests. Samples included coal, bottom ash, mechanical collector hopper ash, electrostatic precipitator hopper ash, scrubber slurry, scrubber make-up water, and particulates sampled isokinetically at the inlet to the scrubber and at the outlets to the precipitator and scrubber. The variety of samples required the use of several different handling and preparation techniques. Concentration measurements using wet chemistry, atomic absorption spectroscopy, and X-ray fluorescence spectroscopy allowed the calculation of a mass balance for arsenic, copper, iron, lead, molybdenum, niobium, rubidium, selenium, strontium, tin, yttrium, zinc, zirconium, and the radioactive species lead-210, polonium-210, and radium-226. Thirteen of the 16 elements gave successful mass balances within + or - 25%, indicating that the sampling procedures and mass flow rate estimates were reasonably accurate. (Author abstract modified)

44178

APTIC NO. 67476

Miller, C. W. and T. M. Shafik

CONCENTRATIONS OF OMS-33 IN AIR FOLLOWING REPEATED INDOOR APPLICATIONS. Preprint, Dept. of Health, Education and Welfare, Atlanta, Ga., *Central America Research Station, San Salvador (El Salvador); and Environmental Protection Agency, Research Triangle Park, N. C., Chemistry Branch Pesticides and Toxic Substances Effects Lab.*, 10p., 1973 (7). 10 refs.

The atmospheric concentrations of the insecticide o-isopropoxyphenyl-n-methylcarbamate (OMS-33) following repeated indoor applications were measured. The concentration of the chloracetate derivative is measured by electron capture gas chromatography. The lower limit of detectability is 50 picograms. Large scale field trials on the efficacy of OMS-33 were made in El Salvador. The day after field spraying, the concentration of OMS-33 in the air was 7 ng/l. This concentration decreased sharply to zero by the 14th day. During the rainy season air concentrations reached 34 ng/l which represented approximately a five-fold increase over any amount previously encountered. With the onset of the dry season, concentrations decreased to low levels. The insecticide persisted in the air at high concentrations for longer periods during the wet season as compared to the dry season.

44179

APTIC NO. 64168

Shaw, H.

THE EFFECTS OF WATER, PRESSURE, AND EQUIVALENCE RATIO ON NITRIC OXIDE PRODUCTION IN GAS TURBINES. Preprint, *American Society of Mechanical Engineers*, New York, 7p., 1973. 21 refs. (Presented at the *American Society of Mechanical Engineers, Winter Annual Meeting*, Detroit, Mich., Nov. 11-15, 1973, Paper 73-WA/GT-1.)

A semiempirical technique for predicting the nitrogen oxide emission index from the combustion of distillate type fuels with air was developed. This technique was devised to help evaluate combustion modification procedures for lowering NOx emissions. Equilibrium calculations, generally used to obtain directional estimates of pollutant concentration, can lead to errors. Some possible pitfalls in using equilibrium calculations are illustrated. The semiempirical technique is based on chemical kinetics and neglects fluid-dynamic effects. The kinetics are based on the modified Zeldovich chain mechanism for nitric oxide production from hot air and Fenimore's data for prompt NOx. The resulting expression lends itself to hand calculation, provided the NO equilibrium value is known at the temperature and pressure of interest. Excellent agreement was

obtained with experimental results from gas turbines. The apparent time required to produce NOx was the only adjustable parameter used to fit the data. A large volume of data from aircraft gas turbines was correlated by assuming an apparent residence time of 0.5 millisecond. The effectiveness of water addition in minimizing NOx emissions was predicted for a model of an industrial gas turbine using 2 millisecond residence time. These residence times were short, but physically reasonable. The calculations predicted somewhat the maximum NOx emission index shifts from stoichiometric combustion to lean combustion as air preheat temperature was lowered. This prediction was not confirmed experimentally. (Author abstract)

44180

APTIC NO. 67418

Triplet, M. B., R. H. Spitzer, A. A. B. Pritsker, and K. J. Yost

ANALYSIS OF CADMIUM PATHS IN ZINC SMELTER OPERATIONS. *National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 73-88. 2 refs. (Aug. 8-10.)*

NTIS: CONF-730802

An aggregate model of cadmium paths in zinc smelter operations is presented. The model looks at the flow of cadmium in a zinc smelter as a GERT network (Graphical Evaluation and Review Technique network). The network approach allows the clear identification of the processes by which Cd is transported throughout smelter operations. The standard GERT computer program is used to list all the Cd flow paths from source to sink and to obtain estimates of the percentages of the Cd that would result at the sink nodes of the network. Empirical data concerning Cd losses were obtained from a Zn company, and these data were used to develop the parameters of the network model. The sensitivity of the model results to changes in the parameter values was investigated. The main environmental losses were due to the dryer, sinter stack, and coker stack. The other Cd losses remained in the plant in the form of process residues, scrap piles, or spillages. (Author abstract modified)

44181

APTIC NO. 67527

Environmental Protection Service, Ottawa (Canada), Air Pollution Control Directorate

AIR POLLUTION IN CANADA. 48p., 1973.

A nation-wide inventory of 1970 air pollutant emissions in Canada is presented, with data being tabulated for carbon monoxide, particulates, sulfur dioxide, hydrocarbons, and nitrogen dioxide. Emissions in thousands of tons per year are 17,312 for CO, 2290 for particulates, 7209 for SO₂, 3072 for hydrocarbons, and 1359 for NO₂. Gasoline-powered vehicles contribute the largest share of the CO emissions, accounting for approximately 74%. Industrial processes and solid waste incineration operations account for 8% of the CO emissions. The largest contributor to particulate emissions is industry, accounting for about 58% of the total. Forest fires, fuel combustion, and transportation account for 16, 17, and 3% of the particulates, respectively. Industrial processes are responsible for 76% of the sulfur dioxide emitted, with fuel-burning accounting for another 22%. Transportation sources account for 76.8% of the total hydrocarbons and for 62% of the total NO₂. Fuel combustion by stationary sources is responsible for 32% of the NO₂ emitted.

44182

APTIC NO. 67806

California Air Resources Board

A FINAL REPORT ON AN EMISSION INVENTORY AT KAISER STEEL. Rept. 73-20-5, 15p., Sept. 18, 1973.

An emission inventory of sources at Kaiser Steel and a schedule for compliance for each source not now in compliance with San Bernardino County Air Pollution Control District regulations were developed. The total emissions from the

Kaiser Steel plant in tons/day and tons/yr of the various air pollutants, and the percentage of contribution of most of these emissions to the total emission inventory for San Bernardino County are tabulated. The District has no countrywide information on the emissions of hydrogen sulfide, ammonia, or gaseous fluoride. The total emissions are these: particulate matter 11.4 tons/day, 4161 tons/yr; sulfur dioxide 27.9 tons/day, 10,184 tons/yr; oxides of nitrogen as nitrogen dioxide 13.5 tons/day, 4928 tons/yr; carbon monoxide 98.7 tons/day, 36,026 tons/yr; organic compounds as methane 7.7 tons/day, 2811 tons/yr; H₂S 0.2 tons/day, 73 tons/yr; NH₃ 0.5 tons/day, 183 tons/yr; and gaseous fluoride 1.0 tons/day, 365 tons/yr. Most of the emissions of particulate matter, organic compounds, H₂S, and NH₃ are from published emission factors or engineering estimates and most of the emissions of SO₂, NOx, CO, and gaseous fluorides are from source test data.

1972

44183

APTIC NO. 67711

Curry, David A. and Dudley G. Anderson

AIR POLLUTION AND NOISE EFFECTS. CHAPTER FOUR. In: *Procedures for Estimating Highway User Costs, Air Pollution, and Noise Effects.* Stanford Research Inst., Menlo Park, Calif., National Academy of Sciences-National Academy of Engineering National Research Council, Highway Research Board, National Cooperative Highway Research Program Rept. 133, p. 37-47, 1972. 34 refs.

Procedures for estimating the magnitude of air pollution and noise effects on the community are discussed. To select highway design alternatives to minimize pollution, the trade-offs between design parameters such as highway cost, travel time, speed changes, vehicle costs, and air pollution effects must be measured. Data is given on calculating emission levels (carbon monoxide, hydrocarbons, and nitrogen oxides) for a reference year based on various performance variables. An approximate value of lead emissions is determined, but it is not possible to provide a value for emissions of smoke or other particulates. Noise effects and measurement are also discussed.

44184

APTIC NO. 67797

Kennedy, A. M., V. M. M. Brown, and N. J. Peet

SURVEY OF FUEL AND ENERGY USAGE IN THE CHRISTCHURCH URBAN AREA (1966-1969). *Canterbury Univ., New Zealand, Dept. of Chemical Engineering, 85p., Feb. 1972. 44 refs.*

A survey of fuel usage covering the years 1966 to 1969 was made and emissions were estimated for smoke, sulfur dioxide, hydrocarbons, and nitrogen oxides in the Christchurch, New Zealand urban area. Total emissions changed comparatively little from 1966 (18,840 tons) to 1969 (18,680 tons). Domestic emissions fell by 23% while those from transportation increased by 18% even though sales of coal for transportation had been largely phased out by 1969. The total emissions fell from 164 to 156 lb/head of population while domestic emissions dropped by 26% from 54 to 40 lb/head. Estimated emissions from coal, oil, and minor fuels are tabulated. Fuel sales trends are paralleled by a fall of 23% (2400 tons) in the total emissions from coal, balanced almost exactly by the increased emissions from petroleum products. Domestic sources are responsible for the major part (60%) of the decline in coal emissions, industrial and commercial sources contributing 20%, and transportation 10%. Smoke and sulfur dioxide emissions show a decline, and hydrocarbons and nitrogen oxides an increase.

44185

APTIC NO. 67745

Lees, Lester

WHY THE ENERGY CRUNCH CAME IN THE 70S. *Cry Calif., 7(4):29-34, 1972.*

EMISSION SOURCES

44190

Time factors in primary energy demand and supplies of coal, oil, natural gas, and nuclear power in the United States, particularly in the state of California, are discussed in relation to time-scale problems encountered in air pollution control attempts. The energy demand projection for the period 1971-1985 shows a 4.2% annual growth rate as compared with a 2.6% projected supply growth rate. The mismatch between time scales of supply and demand is very apparent in the South Coast air basin of California where proposed nuclear power generation facilities, necessitated by stringent emission control standards, have not been able to meet geological stability criteria. Another alternative, viz., the construction of coal burning plants in the Southwest desert appears to be slowed also as a result of stricter adherence policies regarding ambient air quality standards set forth by the Environmental Protection Agency. Necessary components of a long term energy/environment strategy include: energy conservation, research and development of relatively clean alternative energy sources, and the invention of new institutions and social-cultural patterns.

44186

APTIC NO. 63611

Lucas, Albert G. and George W. Niepoth

FUTURE OF GASOLINE ENGINES. *Society of Automotive Engineers, Inc., New York, Environmental Protection Agency, and Dept. of Transportation, Soc. Automotive Engrs. Int. Conf. Transp. Environ., Proc., Washington, D. C., 1972. Part I, p. 94-102. 16 refs. (May 31-June 2, Paper 720615.)*

The present spark ignition, reciprocating piston, gasoline engine is examined against the basic requirements for an automotive powerplant. The important requirement of emission control effects these basic requirements. Emissions include exhaust, evaporative, crankcase, and other emissions. The emission potential, the prospect of reducing emissions to an acceptable level, and the effect of emission reduction on future gasoline engines are discussed. Emission control systems include a positive crankcase ventilation system, leaner air/fuel mixtures, higher idle speed, leaner choke calibration to give less fuel on cold start, retarded spark timing, dual catalytic converters, air injection, and exhaust gas recirculation. Unfortunately, use of predicted emission controls requires use of lead-free gasoline for the long term durability of the catalytic converter. This can reduce fuel octane benefits. Reduction in compression ratio will cause lost engine power and fuel economy. Exhaust gas recirculation and lean carburetor mixture ratios also reduce engine power. Use of lead-free fuel, electronic ignition, and other improvements will require less field maintenance, while other items may require more field maintenance, such as use of catalysts and recirculation. The rotary engine is gaining popularity as a replacement for a spark ignition engine.

44187

APTIC NO. 67734

Masek, Vaclav

NEW CONTRIBUTIONS TO THE PROPERTIES OF COKERY FLUE DUST: IV. BITUMINOUS COAL DISCHARGE DISTILLATION PLANTS. (*Neue Erkenntnisse ueber die Eigenschaften des Flugstaubes aus der Kokerei. Teil IV: Steinkohlenteerdestillationsanlagen.*) Text in German. *Zentr. Arbeitsschutz*, 22(11):332-337, 1972. 11 refs.

The granulometric composition and the 3,4-benzopyrene content of 20 different dust samples from bituminous coal cokeries in Czechoslovakia were investigated. The dust samples were taken by means of Schleicher-Schuell filters and Soxhlet filters for subsequent chromatographic analysis for 3,4-benzopyrene. The particle size was usually smaller than 50 microns. While 3,4-benzopyrene was detected in all samples regardless of particle size, the 3,4-benzopyrene content was highest in the respirable fraction not larger than 5 microns, accounting for 26.8-76.3% of the fly ash by weight. The 3,4-benzopyrene contents in the dust particles ranged from 128 to

14,200 micrograms/g. Hot pitch handling operations generate the highest 3,4-benzopyrene discharge. Due to its very low solubility in the body fluids, the 3,4-benzopyrene as present in unfractionated dust can not be directly regarded as a health hazard.

44188

APTIC NO. 67492

Monroe, F. S.

AIR POLLUTION CONSIDERATIONS IN SOLID AND LIQUID WASTE DISPOSAL. In: *Air Pollution and Industry*. R. D. Ross (ed.). New York, Van Nostrand Reinhold Co., 1972, Chapt. 10, p. 471-478. 13 refs.

Various solid and liquid waste disposal systems are reviewed in terms of their air pollution implications. Incineration is the most developed solid waste disposal method where sufficient ground is unavailable for landfill. Most solid waste incinerators require stack gas cleanup devices unless the waste is almost totally lacking in ash or paper. Controlled feeding and improved automatic combustion controls are a necessity. Partial pyrolysis or two-stage combustion is an effective, though expensive, solid waste disposal method, and some units do not require scrubbers to meet air pollution emission codes. Where the available methods of landfill, incineration, and pyrolysis are used, air pollution considers also concern odor control, with each individual situation requiring appropriate vigilance. The primary effects of liquid waste disposal on air pollution depend on the minimizing of evaporation of organics, elimination of odors, a high degree of oxidation (where used), and removal of polluting gases (if existing in sufficient quantity). More emphasis should be placed on recycling of liquid wastes back into chemical processes themselves wherever possible.

44189

APTIC NO. 64272

Morris, Deane N.

FUTURE ENERGY DEMAND AND ITS EFFECT ON THE ENVIRONMENT. *Rand Corp., Santa Monica, Calif., National Science Foundation Grant GI-44, Rept. R-1098-NSF, 52p., Sept. 1972. 30 refs.*

The effect of new environmental standards on the consumption of fossil fuels, on stationary power systems, and on transportation systems, and preliminary investigations into the use of energy for environmental improvement are discussed. The options available for meeting air pollution emission standards now being imposed on fossil fuels include: substitution of cleaner fuels; installation of control equipment; and, in the case of powerplants, simply switching from fossil fuels to other sources. The trend toward substitution of fuels to reduce air pollution is already evident and it is felt that it will continue, especially with respect to low-sulfur fuels. However, substitution of fuels will not alter appreciably the total demand for energy by stationary systems, but the distribution of demand among the fossil fuels will obviously change. No conclusions are reached on the actual character of future fuel substitution in the future, although coal gasification is one of the most likely possibilities. It is difficult to estimate the overall environmental impact of energy production over the next 30 years. Since most of the basic conflicts between environmental quality and energy production are due to the continuing high growth rate in energy demand, much discussion has recently centered on the effect of deliberate reductions in growth. Reductions in economic, demographic, and energy consumption growth rates are important means, though not the sole means, to environmental improvement. For example, the conclusions of one study for a selected group of pollutants prominently associated with energy showed that an active abatement policy at a given growth rate is far more significant in achieving certain environmental objectives than suppressing growth.

44190

APTIC NO. 67804

Troll, V.

CONTRIBUTION TO THE STATISTICAL ANALYSIS OF POLLUTANT CONCENTRATION MEASUREMENT

DATA. (Ein Beitrag zur statistischen Analyse von Immissionsmesswertkollektiven). Text in German. *Landwirtschaft Forsch.*, vol. 25:237-240, 1972. 3 refs.

Using emission measurement values, a range of reliability of the expectation values can be calculated, with the help of symmetrization of discrepant random sample distributions. The analysis of variance allows the elimination of space and time variability from a collection of emission indication values.

44191

APTIC NO. 67456

Yablochkin, V. D. and V. A. Shchirskaya

STUDY OF WAYS TO REDUCE THE TOXIC GAS RELEASE OF POLYMERS. In: *Current Problems in Space Biology and Medicine*. (Aktualnyye voprosy kosmicheskoy biologii i meditsiny). p. 305-308, 1971. Translated from Russian. Joint Publications Research Center, Arlington, Va., p. 132-134, July 14, 1972.

NTIS: JPRS 56499

Methods to upgrade polymers so that toxic, volatile gases are not released are discussed. The influence of thermostating and forming of sheets by hot rolling with synthetic resins on the release of volatile substances by a compound based on butyl-methacrylic ester was studied. The greatest decrease in gas release was observed from samples of the compound rolled into sheets with synthetic resins. Polycarbonate covering had greater mechanical strength and adhesion to the surface of the compound than silicone covering. Thermostating at 40 C for 15-25 days exerted a considerably lesser effect on the gas release process in comparison with hot rolling; at 90-130 there was thermal destruction of the sample resulting in increased concentration of released substances.

44192

APTIC NO. 67809

Federal Council on Science and Technology, Committee on Energy Research and Development Goals

TOTAL ENERGY SYSTEMS, URBAN ENERGY SYSTEMS, RESIDENTIAL ENERGY CONSUMPTION (FINAL REPORT). Dept. of Housing and Urban Development, 348p., Oct. 1972. 73 refs.

NTIS: PB 221374

Summary reports assessing the technology of total energy systems, urban energy systems, and residential energy systems are presented along with background information on the Federal Council on Science and Technology, Housing and Urban Development subpanel membership and task assignments, complete subpanel reports for each topic, and various task submittals and supplementary reports produced by the subpanel participants. Topics covered include: the state of the art of total energy systems which can reclaim energy from the combustion gases and the condenser of a conventional electric power plant, constraints on total energy systems development, potential benefits from total energy systems, conventional and dual purpose urban energy systems, the possibility of fuel savings in dual purpose steam plant systems utilizing heat recovery, the decrease in release of combustion products from dual purpose urban energy systems, the application of urban energy systems to new cities, the present use of district heating, characterization of typical residential energy consumption, residential heating and air conditioning/ventilation systems, technological and institutional problems, and economic problems in system development.

1971

44193

APTIC NO. 67474

Buenz, P.

EMISSIONS FROM OIL BURNERS. CAUSE, MEASUREMENT, AND LIMITS OF PARTICULATE EMISSIONS FROM OIL-FIRED BURNERS. (Emissionen aus Oelfeuerungen. Ursachen, Messung und Begrenzung des Staubauswurfs aus oelgefeuerten Dampfkesseln). Text in German. *Brennstoff-Waerme-Kraft*, no. 23:339-340, 1971.

20

Pollutant emissions and the mechanism of their formation, as well as the mechanism of the conversion of sulfur dioxide to sulfur trioxide in flue gases from large-capacity oil burners are described. Fly ash, composed mainly of oxides of vanadium and other heavy metals, alkali and alkaline-earth metals; soot composed essentially of carbon with adsorbed condensed hydrocarbons; and coke formed as a result of incomplete combustion are the particulate emissions generated by oil-firings. Both nitric oxide and nitrogen dioxide formed during the combustion process in oil-firing equipment react with SO₂ oxidizing it to sulfur trioxide, while being reduced to nitric oxide and nitrous oxide, respectively. The SO₂-SO₃ conversion beyond the stack is largely determined by the presence and concentration of nitrogen oxides.

44194

APTIC NO. 63641

Kang, Yong Shik

COMBUSTIBILITY IMPROVING EFFECT OF ORGANOMETALLIC SALT FOR FUEL OIL. (Yonryoyu yonsolee mochinun yugi kumsokyom u choyon hyokwa). Text in Korean. *Daehan Hwahak Hwoeje* (J. Korean Chem. Soc.), 15(6):330-347, 1971. 34 refs.

The catalytic effects of metallic salts on the combustion of diesel fuel oil were studied. In the case of organometallic salts, the active species are the metallic oxides resulting from the combustion of the salts. The oxides act only on the residual solid carbon produced from the fuel oil combustion. The catalytic activity can be explained with the semiconductor theory just as in the case of the gas phase reaction. The chemical rate constant of the combustion of carbon soot from the diesel fuel oil is 1.1 times 10 to the 4th power exp (-16,600/T) below 800 K. By the addition of metallic oxides, the rate constant increases remarkably. This work has substantiated the belief that the effect of the metallic salts on the fuel oil combustion can conveniently be studied by checking the effect of the corresponding metallic oxide on the soot carbon directly.

44195

APTIC NO. 64142

Wasilewaka, J. and U. Krause

INDICES OF EMISSION OF POLLUTANTS TO THE ATMOSPHERE FROM THE ROLLING MILLS OF IRON AND STEEL WORKS. (Wskazniki emisji zanieczyszczen do atmosfery z walcowni hut zelaza i stali). *Air Conserv.* (English translation from Polish of: *Ochrona Powietrza*), 5(6):6-10, 1971. 10 refs.

NTIS: TT 72-54022/6

Emissions of dust and sulfur dioxide were measured at five rolling mills of iron and steel plants, and indices of emission were determined in kg/tons of rolled products. The average SO₂ concentration in the flue gases from the wire mill furnace was 1.27 g/cu m of dry flue gas. Average SO₂ concentration from a furnace in the accessories department was 0.26 g/cu m. Average SO₂ concentration from the soaking furnaces of the cogging mill was 0.92 g/cu m. Average SO₂ from a pusher furnace of a large rolling mill was 0.43 g/cu m. The indices of emission proved that the highest SO₂ emission was 1.21 kg/tons in the wire mill, while the lowest was 0.71 kg SO₂/ton in the large rolling mill. Average dust concentrations were 28 mg/cu m combustion gases in the wire mill and 14 mg/cu m in the Accessories department. The index of dust emission ranged from 0.018 to 0.040 kg/ton. The lowest index was in the cogging mill, while the highest was in the Accessories mill.

1940

44196

APTIC NO. 67712

Archibald, F. R. and W. A. Harris

THE IMPORTANCE OF TEMPERATURE, AND OF SULPHUR DIOXIDE CONCENTRATION, IN ROASTING ARSENOPIRITIC CONCENTRATE. *Can. Inst. Mining Met.*, 1940:757-761, 1940. 4 refs.

CONTROL METHODS

44202

The most satisfactory conditions for roasting arsenopyritic concentrate were studied. The importance of controlling the temperature and the sulfur dioxide concentration were determined. Three-dimensional graphs are presented representative of a series constructed from data obtained in laboratory tests. The essential features of a roasting test are represented as a surface, the edge of which shows the time-temperature relation, and the depth the concentration of SO₂. The chemical reactions involved in roasting to produce a product from which the gold can be readily extracted by cyanide solutions are discussed.

CONTROL METHODS

1974

44197

APTIC NO. 67896

Archer, David H. and Lee E. Brecher

APPARATUS AND METHOD FOR DESULFURIZING AND COMPLETELY GASIFYING COAL.

(Westinghouse Electric Corp., Pittsburgh, Pa.) U. S. Pat. 3,804,606. 6p., April 16, 1974. 6 refs. (Appl. Jan. 11, 1972, 6 claims).

A process in which coal is desulfurized and completely gasified utilizes several fluidized beds having interconnecting conduit means for the exchange of particulate material and gases in a generally counterflow relationship to produce a gaseous fuel having a very low sulfur content and ash. The desulfurized gaseous effluent from the system is used as fuel for a combined gas and steam turbine power plant in which a portion of the pressurized air produced by the gas turbine compressor is utilized by the coal gasifying apparatus. The hot gases from the process are used to dry the coal, producing an economical power generating system which emits a minimum amount of sulfur compounds to the environment. (Author abstract modified)

44198

APTIC NO. 67894

Arnold, Orlan M. and Carlo A. Vancini

AIR CLEANING APPARATUS. (Peabody Engineering Corp., New York) U. S. Pat. 3,798,880. 10p., March 26, 1974. 9 refs. (Appl. May 25, 1972, 13 claims).

An air cleaning apparatus for purifying particulate-laden air in an enclosure, such as a room, is designed to eliminate or reduce contamination of the outside temperature into which the air is discharged. A wall toward which the air is advanced is covered by a water film which flows downwardly along the surface of the wall to form a flood sheet. The wall may be inclined to the vertical to facilitate the washing of the wall by the downward flow of water if desired. The water is collected in a sump below the bottom of the wall under which the air flows into a washing zone wherein contaminants are removed. After washing, the air passes through a drying zone to remove the wash liquid and is then discharged into the atmosphere or recirculated. A screw conveyor is employed to scrape the top of the wall for removal of deposits.

44199

APTIC NO. 67699

Bauerle, George L. and Ken Nobe

NITRIC OXIDE REDUCTION WITH HYDROGEN ON MIXED METAL OXIDE CATALYSTS. Ind. Eng. Chem., Prod. Res. Develop., 13(3):185-193, 1974. 11 refs.

(Presented at the American Chemical Society, National Meeting, 165th, Dallas, Tex., April 1973.)

Catalytic reduction of nitric oxide with hydrogen was investigated on a number of mixed oxide and oxide mixtures in a laboratory integral reactor using a feed gas containing 520 ppm of NO and 3000 ppm of H₂ in a nitrogen carrier gas to determine catalytic activity and ammonia formation. Then

some of the more promising catalysts were tested in actual automobile exhaust to determine their feasibility in catalytic reactors for NO reduction. Highest yields of NH₃ at 90% conversion of NO or higher in the first test were observed with rare earth nickel iron oxide and copper-vanadium oxide, copper-nickel oxides, monel, platinum, palladium, and rhodium. Each of these catalysts showed stoichiometric conversion to NH₃ at a specific temperature. Platinum and palladium maintained this stoichiometric conversion up to 500 C; monel showed a sharp drop in NH₃ yield above the temperature of stoichiometric conversion (450 C). Lowest NH₃ maxima for NO conversion levels above 90% were observed with ruthenium, mixed ruthenium oxides, and a series of nickel-containing catalysts. When tested in auto exhaust, ruthenium and mixed ruthenium oxides were particularly active and appeared to exhibit true selectivity for reduction of NO to N₂. (Author abstract modified)

44200

APTIC NO. 67900

Beavon, David K.

PURIFICATION OF CLAUS PLANT TAIL GAS BY WATER WASHING. (Ralph M. Parsons Co., Los Angeles, Calif.) U. S. Pat. 3,798,316. 4p., March 19, 1974. 4 refs. (Appl. Sept. 8, 1972, 5 claims).

A method for reducing sulfur losses present in the tail gas of Claus plant emissions is described which, unlike prior art Claus tail gas treatments, eliminates material water pollution problems and avoids passing the process gas through a heat exchanger which would be subject to plugging. The process involves passing the Claus effluent to a relatively high temperature (150-160 F) reaction-absorption zone where, in the presence of water as the absorption-reaction medium, sulfur is formed by the reaction of hydrogen sulfide, sulfur dioxide, and other sulfurous compounds. The water containing sulfur and other sulfurous compounds is then recycled back to one of the Claus conversion stages where the formed sulfurous compounds dissociate into S, H₂S, and SO₂ for conversion to elemental S in the Claus reactor. The residual gas stream is then passed to a second absorption zone to remove residual SO₂ and to a final water condensation zone before being vented to the atmosphere. (Author abstract modified)

44201

APTIC NO. 67510

Breton, R. A., T. R. Koblish, and R. L. Marshall

DESIGN AND TEST LIMITATIONS ON REDUCING NOX IN GAS TURBINE COMBUSTORS. Preprint, Society of Automotive Engineers, New York, 11p., 1974.

9 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress, Detroit, Mich., Feb. 25-March 1, 1974, Paper 740182.)

Experiments were performed to determine the limitations, as imposed by practical combustor and fuel systems designs, on the potential reduction of nitrogen oxide emissions in gas turbines based on flame temperature and residence time predictions. Testing is performed on a premix combustor designed to operate at an equivalence ratio of 0.75 as well as on burner design incorporating lean equivalence ratios, premixing, and rapid mixing concepts. The effects of nonuniform partially vaporized fuel-air mixtures as well as restrictive mixing rates attainable in practical combustors appear to severely limit the full attainment of theoretical NO_x reduction. The current state-of-the-art solution to NO_x control with water injection apparently conflicts with carbon monoxide standards at certain conditions. Extensive research is required to achieve a practical dry solution for NO_x control, with vaporized and well premixed burners with controlled rapid mixing of dilution air being the logical avenues for further research and development. (Author abstract modified)

44202

APTIC NO. 67830

Brown, R. A., H. B. Mason, and R. J. Schreiber

SYSTEMS ANALYSIS REQUIREMENTS FOR NITROGEN OXIDE CONTROL OF STATIONARY

SOURCES (FINAL REPORT). Aerotherm/Acurex Corp., Mountain View, Calif., Environmental Protection Agency Contract 68-02-1318, Task 3, ROAP No. 21ADE-079, Program Element 1ABO13, Rpt. EPA-630/2-74-091, 163p., Sept. 1974. 303 refs.

NTIS: PB 237367/AS

A systems study of requirements for the control of nitrogen oxide emissions from stationary sources is presented with an evaluation of the developments in the character of NOx emission sources and NOx control technology. Coal-fired utility and industrial boilers, followed by stationary internal combustion engines are the planning priority established for NOx control. Coal combustion remains the largest contributor to total stationary source NOx emissions at 42% and contributes 63% of the NOx emissions from electrical utility generation. The most attractive short- and long-term option for control of NOx emissions is combustion modification technology. Priority items are the development of techniques for control of the conversion of fuel-bound nitrogen to nitric oxide and the development of combustion modifications for the major area sources such as pipeline internal combustion engines and commercial and domestic combustion units.

44203

APTIC No. 67688

Buettnier, Helmut

THEORY, LIMITS AND POSSIBILITIES OF THE SEPARATION OF FINE DUSTS WITH WET COLLECTORS. (Theorie, Grenzen und Möglichkeiten der Abscheidung von Feinstaub mit nassarbeitenden Abscheidern). Text in German. Staub, Reinhaltung Luft, 34(10):358-360, Oct. 1974. 13 refs.

The measurement of fractional separation efficiency of wet separators within the range of very fine dust causes considerable difficulty. Neither reliable nor sufficient data are available at present for industrial plants. But the critical data for the separation of very fine dust can be collated from a consideration of the theoretical basis of the single drop impact separation. For venturi scrubbers it is possible to refer to a calculation model which permits the obtainable limiting particle size to be determined as a function of the most important operating data. There is a discrepancy, however, between the values obtained by this method and measured values.

44204

APTIC No. 67910

Carlton-Jones, Dennis

ELECTROSTATIC PRECIPITATION OF FLY ASH REACHES FIFTIETH ANNIVERSARY. J. Air Pollution Control Assoc., 24(11):1035-1038, Nov. 1974. 7 refs.

Fifty years ago electrostatic precipitation, which had been used successfully for collection of sulfuric acid mist, was first applied to a power plant installation for control of fly ash from pulverized fuel. The history of the design and application of the principle as the power generation industry adapted to changing environmental problems and concerns is reviewed. Pulverized coal use in power generation was economically preferable, and electrostatic precipitation was the only reasonable method for controlling the fly ash. The installation of this type of equipment at Tremont Channel (the third station using pulverized coal) was a prompt response to the developing pollution problem created by introduction of pulverized coal. Various control systems were tried on stationary boilers, but scrubbers caused corrosion problems and other methods were not as efficient as electrostatic precipitation. Precipitator efficiency gradually increased over the years, and by 1973 the average efficiency was 99.2% and individual specifications were as high as 99.8%. Advancements in design and application of the fly ash precipitator continue to be necessary and continue to be accomplished as the power generation industry adapts to changing environmental problems and concerns.

22

44205

APTIC No. 67708

Chandler, Geoffrey

THE OIL INDUSTRY AND THE ENVIRONMENT.

Petrol. Rev., 28(326):85-92, Feb. 1974. 18 refs. (Presented at the Institute of Fuel Conference on Fuel and the Environment, Eastbourne, England, Nov. 1973.)

The British oil industry is considered in relation to its environmental impact. The principal air pollutant from petroleum refineries is sulfur dioxide, resulting from the burning of sulfur-containing refinery fuel. Other emissions include smoke and dust, nitrogen oxides, and odors. Nitrogen oxides are not a serious problem in the United Kingdom presently. The best practicable means of carrying out the obligations of the Alkali Act in regard to SO2 emissions is the installation of a chimney stack or stacks of such height that sufficiently low ground level concentrations of SO2 are achieved. The actual SO2 ground level concentration recorded over long periods (1 yr) from a single stack in a nearby area where maximum concentration is expected averages one-sixtieth to one-hundredth of the presumptive limit of 17 ppm recommended by the Factory Inspectorate for occupational exposure. Dusts from catalyst fines are reduced by the use of multi-stage cyclones, while mechanical cleaning of furnace tubes in refineries which produce dust is now superseded by controlled burn off and chemical cleaning. The control of odors from such compounds as hydrogen sulfide and mercaptans remains one of the most intractable of refinery air pollution problems. Such odors are controlled by proper maintenance of equipment and by destructive combustion.

44206

APTIC No. 67507

Chen, N. Y. and S. J. Lucki

PRE-ENGINE CONVERTER. Preprint, Mobil Research and Development Corp., Princeton, N. J., 7p., 1974. 8 refs.

A new catalyst system was developed and tested to overcome problems of operating satisfactorily at full throttle conditions, catalyst life, and catalytic reactor volume which troubled previous automotive catalyst systems. The highly active, stable, and shape-selective zeolite cracking catalyst overcame a major problem in the application of the concept of pre-engine conversion to a moving vehicle. The catalyst is active enough to operate at above 100 LHSV and 900 F. The volume of a catalyst bed for a 300 cu in. engine capable of operating satisfactorily at full throttle would be less than 360 cc - a manageable volume from both side and warm-up considerations. The catalyst has the capacity of processing more than 700 volumes of fuel per volume of catalyst. For a 360 cc catalyst bed, this corresponds to processing 66.5 gal of fuel or about a driving range of 800 to 1000 mi before air regeneration would be necessary. The catalyst appears stable toward oxidative regeneration, and its catalytic activity can be fully restored. Since the required volume of the catalyst bed is small enough, segmented or multiple reactors could be used to accomplish cracking operation and regeneration at all times. (Author conclusions modified)

44207

APTIC No. 67575

Dobrosavljevic, S.

A RATIONAL OUTLOOK FOR THE CONTROL OF HARMFUL EXHAUST EMISSIONS FROM AUTOMOBILES. (Eine rationalistische Aussicht zur Beseitigung der schädlichen Abgasemissionen von Kraftfahrzeugen). Text in German. Bull. Cl. Sci. Tech., 50(10):39-43, 1974. 3 refs.

A reasonable way for reducing harmful exhaust emissions from spark-ignition and diesel engines is presented. The exhaust control optimizes the combustion process and does not impair engine performance. Fuel injection to the combustion chamber wall with thermal control assures the optimum combustion conditions of low air-excess coefficients, a low degree of pressure increase, and a reduced temperature peak, produc-

ing a considerable reduction of carbon monoxide, unburned hydrocarbons, nitrogen oxides, and soot emissions. The lowered thermal level of the combustion process in particular results in a reduction of the nitrogen oxides formation. It is also possible to replace gasoline by other, less harmful derivatives in such engines.

44286

APTIC NO. 67710

Dressel, W. M., P. G. Barnard, and M. M. Fine

REMOVAL OF LEAD AND ZINC AND THE PRODUCTION OF PREREDUCED PELLETS FROM IRON AND STEELMAKING WASTES. Bureau of Mines, Rolla, Mo., Rolla Metallurgy Research Center, Rept. of Investigations 7927, 18p., 1974. 14 refs.

Over 2 million tons of steel furnace dust containing approximately 100,000 tons of zinc and 10,000 tons of lead are produced each year. Recycling of the dusts would conserve mineral resources, lessen land area requirements for disposal, decrease pollution problems, and aid in solving the balance of payment problem. Steelmaking dusts can be pelletized and thermally treated to remove lead and zinc and to reduce the iron oxide to form metallized pellets. In laboratory tests more than 99% of the zinc and 85% of the lead was volatilized from the dust by roasting at 1000 C in carbon monoxide. The volatilized material can be collected and treated further for lead and zinc recovery. Reduction and volatilization of over 95% of the zinc and most of the lead was achieved by roasting self-reducing mixtures of steel furnace dusts and high carbon steelmaking wastes in an inert atmosphere at 1100 C. Over 80% of the iron in the resulting pellets was metallized. (Author abstract)

44289

APTIC NO. 67602

Engels, Lothar-H. and Wolfgang Graeser

DUST TECHNOLOGICAL MEASURES IN THE ASBESTOS FIBER PLANT - A CONTRIBUTION TO THE SUBJECT FILTERING COLLECTORS.

(Entstaubungstechnische Massnahmen im Asbest-Faserwerk - Ein Beitrag zum Thema Filternde Abscheider). Text in German. Staub, Reinhaltung Luft, 34(10):365-368, Oct. 1974.

All points of dust development in the Asbestos Corp. Nordenham fiber plant from the unloading of the freighters to conveyor belt transport to storage are fully enclosed and the dust is drawn off to cloth filters. Five filters alone are used for the conveyor belts, one for the dust agitated by emptying the grabs into the preliminary storage bunker. Inside the fiber plant itself all machines and transporting facilities are fully enclosed and the dust is drawn off by five pipes all feeding into a dirty air plenum from which a volume flow of 660,000 cu m/hr goes to the main filter with 8640 filter bags in ten compartments. At an effective filter area of 15,900 sq m the specific load is 41.5 cu m/sq m/hr. Nylon acetate is used as filter material. An underpressure of 2000 N/sq m is maintained inside the filter. The air flow is cleaned to a residual dust concentration of 0.11 mg/cu m. The specific equipment and construction costs amount to \$1.07/cu m air cleaned hourly. The annual operating and maintenance costs amount to roughly \$176,000.

44210

APTIC NO. 67661

Gamble, Slade B. and Richard A. Kelly

ANTI-POLLUTION APPARATUS. (Flinn and Drefflein Engineering Co., Northbrook, Ill.) U. S. Pat. 3,791,796. 9p., Feb. 12, 1974. 4 refs. (Appl. Nov. 24, 1971, 8 claims).

An anti-pollution apparatus for the reduction of combustible pollutants such as carbonaceous materials, hydrogen, and carbon monoxide is described which reduces retention time requirements for the combustion reaction without undesirable increase in retention chamber temperature and without utilization of excessive amounts of air. The device precludes prior art limitations involving direct exposure of the combustion

zone to pollutant combustibles containing more than 3-5% of combustion inhibitors such as carbon dioxide and water. The anti-pollution apparatus consists of a main passage, a means for flowing a continuous stream of a gaseous carrier through the main passage with the pollutants suspended therein in finely divided form, a free radical generator separate and apart from the main passage but adjacent thereto, including a mixing chamber, a combustion chamber having an inlet portion communicating with the mixing chamber, and an outlet alongside the stream containing the pollutant issuing from the main passage. A means for maintaining the gaseous mixture in the combustion chamber under pressure sufficient for issuance of the effluent at a velocity which exceeds the critical Reynolds number for turbulent flow is provided for admixture of the pollutants with free radicals generated during combustion and for resultant catalysis of the combustion process.

44211

APTIC NO. 67458

Goins, William D.

LEADING THE WAY IN POLLUTION ABATEMENT.

Air Force Civ. Engr., 15(1):28-29, Feb. 1974.

Efforts by the Air Force to cooperate with the Environmental Protection Agency (EPA) and to comply with Federal, state, and local pollution regulations are generally reviewed. Over 50 heating plant conversion projects have been included in the Military Construction Programs from 1968 to 1973. The energy crisis caused a moratorium on proposed boiler conversions, so the Air Force has investigated other means of complying with the pollution criteria while avoiding supply shortages. The Air Force cooperated with the EPA to install a Bahco boiler unit which meets local pollution regulations, uses high sulfur coal, and has construction and operating costs similar to those of a fuel conversion plant. Flue gas is forced into a scrubber where it is distributed and directed against the surface of a hydrated lime slurry. Then the flue gas reverses and enters the first venturi stage. Droplets are separated, and the scrubbing liquid is recirculated. The waste sludge is collected for disposal in a settling pond or sanitary landfill.

44212

APTIC NO. 67495

Hatfield, John D. and Archie V. Slack

LIME-LIMESTONE SCRUBBING: FACTORS AFFECTING CONCENTRATION OF SULFUR DIOXIDE ABSORBING SPECIES IN SOLUTION. Preprint, Tennessee Valley Authority, Muscle Shoals, Ala., National Fertilizer Development Center, 28p., July 11, 1974. 4 refs.

A computer simulation study is performed on factors that affect the total basicity of the aqueous phase of a lime-limestone scrubbing system for the removal of sulfur dioxide from stack gas. The mass transfer of SO₂ from the stack gas to the liquid is dependent largely on the availability of basic species to absorb the acidic gas. The system studied contains the following nine components: calcium oxide, magnesium oxide, sodium oxide, SO₂, sulfur trioxide, carbon monoxide, hydrogen chloride, nitric anhydride, and water. The simulation includes variations in the contents of MgO, Na₂O, and HCl at various values of pH and partial pressure of CO₂ and for several degrees of saturation of salts of calcium sulfite and calcium sulfate. The basicity of the aqueous phase in lime and limestone slurries is increased by increasing the magnesium content in solution, as well as by other factors less subject to control. Complex interrelations between pH, the degree of saturation of CaSO₃-O-5H₂O and the partial pressure of CO₂ occur at constant composition of other components, giving essentially isobasic solutions. (Author abstract modified)

44213

APTIC NO. 67893

Hobo, Nobuhito, and Norio Omori

FUEL INJECTION SYSTEM FOR INTERNAL COMBUSTION ENGINES. (Nippondenso Co., Ltd., Aichi-ken (Japan)) U. S. Pat. 3,797,465. 8p., March 19, 1974. 4 refs. (Appl. June 24, 1971, 5 claims).

A fuel injection system for compression ignition engines is described which provides for control of fuel patterns in response to various engine operation phases in order to eliminate black smoke emissions associated with similar devices preset for a given engine speed. The injection system employs voltage regulators for controlling fuel patterns both at cold starting and full-load operation, a selecting circuit to select the higher of the output control voltage of both voltage generators, a monostable timing pulse generator to provide timing pulses with a pulse duration corresponding to the selected output control voltage, a fuel injection pump provided with an electromagnetic valve to control the quantity of fuel discharged from the pump in accordance with the pulse timing duration.

44214

APTIC NO. 67601

Holzer, Klaus

EXPERIENCES WITH WET DUST COLLECTORS IN THE CHEMICAL INDUSTRY. (*Erfahrungen mit nassarbeitenden Entstaubern in der chemischen Industrie*). Text in German. Staub, Reinhaltung Luft, 34(10):360-365, Oct. 1974. 5 refs.

In order to be able to select scrubbers for a definite application from among all those commercially available, performance and efficiency tests were run on 28 different scrubbers. All scrubbers can be classified based on flow patterns into five different types with characteristic separation efficiencies: jet scrubbers, packed towers, swirl scrubbers, rotational atomizers, and venturi scrubbers. The fractional efficiencies as well as the relation between the overall efficiency and specific power requirements are discussed. The total collection efficiency achieved by the five types of scrubbers with experimental dust siltin (average grain size 1.5 micron, density 2.42 g/cc) ranges from 42% for packed towers to 95.6% for high-pressure venturi scrubbers. That this improvement of efficiency cannot be achieved without additional power is shown in a graph where the specific power consumption in kWh/1000 cu m gas is plotted for 22 examined scrubbers versus the collection efficiency characterized by the boundary grain size which is the aerodynamic diameter at which 50% of the particles are separated. For a boundary grain size of 0.5 micron a low-pressure venturi scrubber consumes 1 kWh/1000 cu m gas, while a rotational atomizer consumes 2.8 kWh/1000 cu m for the same collection efficiency. High-pressure venturi scrubbers achieve boundary grain sizes between 0.06 and 0.2 micron at a power consumption between 3 and 6 kWh/1000 cu m. The operating principles of the five types of scrubbers are briefly reviewed.

44215

APTIC NO. 67705

Huenlich, Hans-Werner

CONSEQUENCES OF THE NEW POLLUTION LEGISLATION FOR FUTURE ENGINEERING AND THE SPECIAL PROBLEMS OF EMISSION BY INDUSTRIAL FURNACE INSTALLATIONS. (*Die Auswirkungen der neuen Umweltgesetze auf die zukünftige Ingenieurarbeit und insbesondere auf Emissionsprobleme bei Industrieofenanlagen*). Text in German. Tonind. Ztg., 98(10):259-262, 1974. 3 refs.

The new more stringent regulations in the Federal Republic of Germany concerning dust emission which require round-the-clock monitoring of the efficiency of dust cleaning facilities revealed the shortcomings of electrostatic precipitators. They achieve residual dust concentrations of 150 mg/cu m to 80 mg/cu m at best. Smooth and satisfactory operation is affected by the slightest changes in the gas composition (for instance a different moisture content), while it has been no problem to maintain a residual dust content of 30 mg/cu m at all times with cloth filters. Three types of cloth filters are mainly available: envelope type filters with air jet cleaning from inside to outside, tubular filters with dust retention on the inside wall of the tubes with combined mechanical and pneumatic cleaning methods working from outside to inside the tube, and tubular bags with dust retention on the external wall and pneumatic

cleaning from inside to outside. For designing cloth filter systems all operating conditions, even the most extreme ones, must be taken into account.

44216

APTIC NO. 67638

Idemura, Hideo

SIMULTANEOUS SO₂ AND NO_x REMOVAL PROCESS FOR FLUE GAS - CHIYODA THOROUGHbred 102 PROCESS. Chem. Economy Eng. Rev., 6(8):22-26, Aug. 1974. 1 ref.

Abatement of nitrogen oxide emissions is discussed. A plant for removing NO_x from stationary sources must permit safe and easy operation at a minimum cost. The Chiyoda Thoroughbred 102 Process was developed under specific plans designed to meet these requirements. Most of the technical problems including those related to operating performance were resolved by drawing on experience with the Thoroughbred 101 flue gas desulfurization plant already in industrial use. At present, research is being conducted with both bench-scale and pilot plant, in an effort to achieve higher economics. The Chiyoda Thoroughbred 102 Process can be used for the simultaneous removal of NO_x and sulfur dioxide. Flue gas is oxidized with ozone to convert part of the nitric oxide to nitrogen dioxide, and then is scrubbed with dilute sulfuric acid containing an iron catalyst to remove SO₂ and NO_x simultaneously. Part of the NO_x absorbed and removed is discharged to the atmosphere as nitrous oxide and nitrogen, the rest remains in the absorbent as nitric acid. The SO₂ absorbed becomes sulfurous acid, which is then oxidized into sulfuric acid. The sulfuric acid produced, which contains HNO₃, is treated with limestone to obtain by-product gypsum. The HNO₃ formed is prevented from accumulating by purging part of it via a waste liquid treatment unit. (Author summary modified)

44217

APTIC NO. 67623

Imamura, Sadao

ECONOMICAL DEODORIZATION MEASURES BY DIRECT COMBUSTION. (*Chokusei sennshoho ni yoru keizaiteki: dasshu taisaku*). Text in Japanese. Nyu Fudo Indasutori (New Food Ind.), 16(8):17-18, Aug. 1974.

Odors have fire points varying from below 40 to about 700 C and they easily burn when they contact flame in the presence of air. Odors can be removed by a short-time contact with flame followed by keeping the resulting gases in an oxidation chamber for a given length of time. A direct combustion deodorizer has been developed with the following characteristics: odors are forced to contact and to mix with flame; a compact heat exchanger which can prevent leaking even at high temperature drop and thermal strain increases the deodorization efficiency; fire-resistant, heat-insulating materials such as ceramic fiber and rock wool are used to prevent thermal shock and to prolong the life of the apparatus; and various fuels can be used. An apparatus having a capacity of 60,000 cu m/hr is being manufactured.

44218

APTIC NO. 67587

Ishiguro, Tatsukichi

TRENDS OF THE DEODORIZATION TECHNIQUE IN JAPAN AND ABROAD. (*Naigai ni miru akusaku buyo gijutsu no doko*). Text in Japanese. PPM (Japan), 5(10):62-69, Oct. 1974. 4 refs.

A discussion is presented on the legal regulations on odor prevention and trends in deodorization techniques, especially on the prevention of odors from plants where animal products are treated. Many plants in Japan have adopted the machines made by the Atlas, Muhlen, and de Laval companies. The continuous rendering system of Duke is especially useful in Japan. This system is also widely used in the U. S. In this system, all the treatment is carried out in a sealed room. Discharged gases are treated first by an indirect cooler condenser and then with direct washing with a scrubber, followed by combustion in an

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incinerator. The system developed by the Hautzentral and Fetschmelze companies, Switzerland, is excellent for the treatment of residues rich in bones. Dead animals are skinned and then crushed before boiling. After cooking, fat, water, and solids are separated from one another. These are used as food for animal husbandry and for industrial applications. The gases discharged from the treating rooms are deodorized completely. The gases are first washed with water and then oxidized with chlorine dioxide solution.

44219

APTIC NO. 67690

Johann, H. P.

EQUIPMENT FROM THE VIEWPOINT OF ENVIRONMENTAL PROTECTION. (*Die Anlagentechnik aus der Sicht des Umweltschutzes*). Text in German. Tech. Mitt., 67(7/8):339-340, July-Aug. 1974.

Technological equipment is discussed as a factor in environmental protection. The design and development of technological equipment should be oriented to the development of new technologies and technological equipment that generate less environmental nuisance, including both the actual production and energy production area, and new technologies and technological equipment for the control of existing environmental pollution, such as in the area of noise control, and air and water pollution abatement. Air pollution by dust emission, which has already assumed considerable proportions, can be abated by modern dust separators designed for the specific technological equipment, and expected quantity, granulometry, and properties of the flue gas to be purified with respect to the legally required emission standards.

44220

APTIC NO. 67558

Kalvinskis, John J.

CARBON ADSORPTION-REDUCTION PROCESS FOR NITRIC OXIDES. (Assignee not given.) U. S. Pat. 3,795,730. 3p., March 5, 1974. 4 refs. (Appl. March 29, 1971, 3 claims).

A combined carbon adsorption, catalytic reduction process for the removal of nitric oxides from large volumes of diluent gases, e.g., combustion gases from fossil-fueled power plants, is described which, unlike prior art carbon adsorption processes, allows for the reuse of the carbon adsorbent, made possible by the employment of low temperature (less than 300°C) reduction. The gas to be treated is contacted with adsorbent carbon which is dispersed with metal materials to enhance low temperature catalytic reduction. The metals may consist of platinum group metals, copper, copper oxide, vanadium, molybdenum, or tungsten(VI) oxides. The catalyst consists of 85% iron(III) oxides, 10% chromium(III) oxides, and 2% chromium(VI) oxides. The adsorbed nitrogen oxides are subsequently reduced to nitrogen and water with a reducing agent selected from the group consisting of ammonia, carbon monoxide, hydrogen, and hydrocarbon gases at a temperature of 300°C. The adsorbent is recycled for use again.

44221

APTIC NO. 67668

Kasaoka, Shigemitsu

STACK GAS DRY DENITRIFICATION AND CATALYSTS. (*Haen kanshiki dassho to shokubai*). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(9):20-30, Sept. 1974. 14 refs.

The simultaneous removal of nitrogen oxides and sulfur oxides by dry catalytic reduction is impossible at present, however, the selective reduction of NOx with ammonia in the presence of sulfates and oxides of copper and iron is experimentally possible. The NOx in the system containing no SOx can be removed efficiently by catalytic reduction with carbon monoxide, hydrogen, and NH3 in the presence of oxides of Cu and cobalt. For the catalytic reduction of NOx and SOx, more than 200 types of catalysts were tested. The conversion rate of nitric oxide and selectivity for nitrogen and NH3 in the NO-CO-N2 and NO-CO-H2O-N2 systems using 33 types of

catalysts were measured, which indicated that the multi-component catalyst containing cobaltous oxide-tricobalt tetraoxide and cupric oxide-nickel oxide were superior in activity and selectivity of NO to N2. The selectivity of NO to N2 in the NO-CO-O2-H2O-N2 system, the reduction of NOx and SOx by hydrogen, hydrocarbon, and hydrogen sulfide, and the reduction of NOx with NH3 were investigated. The simultaneous removal of NOx and SOx is impossible; however, the combination of two processes, the selective catalytic reduction of NOx with NH3 and reaction and absorption of SOx in alkali solution, is conceivable. The evaluation of catalytic activity and applied reaction kinetics in terms of the apparent reaction rate, catalytic effectiveness factor, space velocity, linear velocity, and catalyst dimensions are discussed.

44222

APTIC NO. 67589

Kato, Seitaro

POINTS IN THE TREATMENT OF VAPORS OF ORGANIC SOLVENTS. (*Yuki yozai joki no shori taisaku no yoten*). Text in Japanese. PPM (Japan), 5(10):48-61, Oct. 1974. 17 refs.

A discussion is presented of the general characteristics of organic solvents, photochemical reactivity of hydrocarbons, and the methods of disposal of organic solvent vapors, such as adsorption, combustion, and catalytic oxidation. Photochemical smog originates from hydrocarbons and nitrogen oxides present in the air. Therefore, it is necessary to decrease the hydrocarbon discharged into the air. In the district of Tokyo Bay, it is estimated that 231,000 tons of hydrocarbon is discharged by automobiles. Organic solvents contribute to the air pollution 101,000 tons. Petroleum industry, including distribution, discharges about 60,000 tons. It is believed that these three sources are responsible for 97% of the total air pollution by hydrocarbons. When the amount of gas to be treated is relatively small and the concentration of the vapor to be removed is small, the adsorption method is most suitable. The combustion method is costly unless sufficient care is taken in the recovery of heat. Catalytic oxidation is the most efficient method for the removal of hydrocarbons in discharged gases, provided that the operating conditions are suitable, and is more economical than the combustion method. For example, the estimated cost of treatment of 1000 cu m of air by the catalyst method is about one third of that by the combustion method.

44223

APTIC NO. 67525

Kawa, Walter, Sam Friedman, W. R. K. Wu, L. V. Frank, and P. M. Yavorsky

EVALUATION OF CATALYSTS FOR HYDRODESULFURIZATION AND LIQUEFACTION OF COAL.

Preprint, American Chemical Society, 15p., 1974. 7 refs. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., March 21-April 5, 1974.)

Batch studies on catalyst activities for both liquefaction and desulfurization of coal indicate that a commercial high-surface area silica-promoted catalyst containing 2.4% cobalt and 10% molybdenum on an alumina support is the best composition for such reactions. The catalyst is being used in the Bureau of Mines Synthoil pilot plant. The increased desulfurization that results when this catalyst is pulverized indicates that the sulfur removal reactions are diffusion hindered. Experiments with Mo, tin, nickel, Co, and iron impregnated as single components on high- and low-surface area supports show that Mo catalysts are best for sulfur removal and that Sn catalysts are best for conversion of coal to oil. Maximum desulfurization activity apparently requires a high-surface area catalyst and results from a combination of the catalytic activity of the supported metal components and the promotional effect of the support surface. High desulfurization activities are achieved only when less than a monolayer of metal component is deposited on the support. Even with a low-surface area support, the application of less than a monolayer increases the

desulfurization activity. A high surface area or high metal concentration is not essential for high conversions of coal to oil. (Author summary modified)

44224

APTIC NO. 67949

Kirpatovskiy, I. P.

MEASURES FOR AIR POLLUTION ABATEMENT IN THE PETROLEUM REFINING AND PETROCHEMICAL INDUSTRY. (O merakh po umensheniyu zagryazneniya atmosferynogo vozukha predpriyatiyami neftepererabatyvayushchey i neftekhimicheskoy promyshlennosti). Text in Russian. *Kauchuk i Rezina*, no. 9:1-2, 1974.

Achievements and planned measures for emission control in rubber production in the USSR are described. Soot emissions from carbon black manufacturing plants are controlled by means of efficient bag filters, and the flue gases are incinerated in special waste heat recovery boilers. The organic pollutants generated in synthetic rubber production are incinerated prior to discharge to the atmosphere. Increasing the tightness of tanks, pipings, and pumps, thermal and catalytic destruction of pollutant vapors and gases, collection and utilization of waste gases and carbon black in synthetic rubber production are the basic measures to be taken for emission abatement in the rubber industry.

44225

APTIC NO. 67697

Konchesky, J. L., T. J. George, and J. G. Craig

AIR AND POWER REQUIREMENTS FOR THE VACUUM TRANSPORT OF CRUSHED COAL IN HORIZONTAL PIPELINES. *J. Eng. Ind.*, 96(3):729-734, Aug. 1974. 5 refs. (Presented at the American Society of Mechanical Engineers, Joint Materials Handling Conference, Pittsburgh, Pa., Sept. 19-21, 1973, Paper 73-MH-13.)

The use of vacuum transport of crushed coal in horizontal pipelines in order to avoid the problem of fugitive dusts during coal transport is discussed in relation to air and power requirements for the system. The experimental pneumatic transport system has four schedule-40 carbon steel pipelines with nominal diameters of 2, 4, 6, and 8 in. The lines extend a sufficient length to provide 200 ft straight runs, followed by shorter runs connected by 4, 6, and 8 ft radii bends. Conveying air for the system is provided by a 2500 cfm compressor that draws vacuums to 20 in. of mercury and serves also to charge coal to the feed tank. The air sweeps coal from a 0-80 tph vibrating feeder at the bottom of a 5 ton feed tank and carries the coal through the test section into a receiver. Air from the receiver is drawn through a dust separator and an orifice and is then discharged to the atmosphere. Vacuum transport test data are tabulated for coal characteristics, atmospheric conditions, flow at pick-up, and pressure drop in the system.

44226

APTIC NO. 64347

Kulnig, Heinz

TEST STAND EXPERIMENTS WITH THE KIRUNA EXHAUST GAS CATALYST. (Pruefstandversuche mit dem Kiruna-Abgaskatalysator). Text in German. *Z. Erzbergbau Metallhuettenwesen*, 27(6):292-298, 1974. 3 refs.

The Kiruna exhaust gas catalyst was tested with a four-stroke six-cylinder diesel engine with direct injection (static injection initial adjustment 21 degrees, nominal revolution number 2800 rpm, nominal power 130 HP, maximum air throughput 500 cu m/hr). The catalyst used had a length of 386, a width of 308 and height of 340 mm, a total weight of 31 kg and a mass volume of 10.5 l. The active catalyst elements, rod-shaped platinum-coated rigid ceramic elements, are accommodated in chambers formed by the perforated walls of the catalyst casing of stainless steel. The exhaust gases pass radially through the cylindrical chambers. For the tests driven according to the California 13 mode diesel emission cycle an injection initial adjustment of 12 degrees was used. Through this delayed initial

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injection the carbon monoxide, hydrocarbon and soot emission increases. The tested Kiruna catalyst ignites at a temperature of somewhat below 200 C. The still cold catalyst improved the exhaust gases considerably. The hydrocarbon emission is reduced from the start by 75%. Also, CO is partially oxidized prior to ignition of the catalyst. After ignition of the catalyst, which occurred in the tested case at an engine load of only 25%, the efficiency of CO reduction was 100% and of hydrocarbon reduction 95%. The increase of the carbon dioxide emission, or rather reduction of the oxygen concentration by a maximum of 0.2% by volume, can be termed insignificant. A reduction of the nitric oxide and nitrogen dioxide concentrations was observed during idling and at low load operation. During idling NO was reduced by 39%, NO₂ by 84%.

44227

APTIC NO. 67996

Kunibe, Susumu

ACTIVATED CARBON AND ITS USE. (Kasseitan to sono yoto). Text in Japanese. *Ehara Jiho (Ehara Times)*, no. 88:23-30, June 1974. 2 refs.

The commonly used industrial adsorbents are activated charcoal, silica gel, activated alumina, activated bauxite, zeolite, clay, and ion exchange resins. The general characteristics of these adsorbents are extremely large surface area and high porosity. The adsorption mechanism of adsorbents consisting of numerous capillaries and the relationship between vapor pressure or concentration and absorption rate are discussed. The production method for activated charcoal from plant materials (lumber, charcoal, fruit shell) and mineral materials (coal, pitch, coke) is described. The characteristics of activated charcoal are discussed in terms of physical properties in comparison to the other adsorbents. The industrial scale adsorption by fixed adsorption, mobile adsorption, fluid adsorption, and catalytic filtration adsorption methods are described with schematic diagrams of equipments. The regeneration procedure for activated charcoal by low temperature heating, high temperature heating, use of organic chemicals, use of inorganic chemicals, wet air oxidation, biological decomposition, and electrolysis are discussed. The use of activated charcoal in gaseous phase for solvent recovery, desulfurization of exhaust gas, deodorization, and air purification and the use in the liquid phase for the removal of BOD (biological oxygen demand), COD (chemical oxygen demand), oil, solvent, coloring agents, aromatic compounds, and some inorganic compounds are discussed.

44228

APTIC NO. 67812

Kyle, B. G. and N. D. Eckhoff

ODOR REMOVAL FROM AIR BY ADSORPTION ON CHARCOAL (FINAL REPORT). Kansas State Univ., Manhattan, Environmental Protection Agency Contract EHSD 71-4, ROAP No. 21AXM-061, Program Element 1ABO15, Rept. EPA-650/2-74-084, 110p., Sept. 1974. 10 refs.

NTIS: PB 236928/AS

The efficiency of charcoal for removing odorous organic vapors at extremely low concentrations in air was evaluated at ambient conditions, using an acetaldehyde-Pittsburgh PCB charcoal system and an ethylmercaptan-Pittsburgh BPL charcoal system. Fixed-bed breakthrough data were taken for the acetaldehyde system at an acetaldehyde concentration 28 ppm and were analyzed by means of a modeling approach which indicated that the rate-controlling step was intraparticle diffusion. Preliminary design calculations based on this work indicated that fixed-bed adsorption with charcoal was a feasible process for 98% removal of small acetaldehyde concentrations in polluted air. An integral reactor approach using Pittsburgh BPL charcoal was utilized in a study of the catalytic oxidation of ethylmercaptan (20-125 ppm). Diethyldisulfide was identified as a reaction product, and the reaction appeared to be one-half order in ethylmercaptan concentration. Preliminary design calculations indicated that 99% removal of ethylmercaptan from air by catalytic oxidation on charcoal was feasible. (Author abstract modified)

44233

APTIC NO. 64883

Leech, C. A., III and L. B. Campbell

SPINEL SOLID SOLUTION CATALYSTS FOR AUTOMOTIVE APPLICATIONS. *Preprint, American Chemical Society, Washington, D. C., 39p., 1974. 4 refs. (Presented at the American Chemical Society Annual Spring Meeting, Los Angeles, Calif., March 31-April 5, 1974.)*

The application of spinel solid solution catalysts to automotive emissions control was investigated. Powdered samples of solid solution catalysts were examined after varying thermal treatment for stability of catalytic activity toward oxidation and surface area stability. Selected solid solutions were supported on monolithic substrates and examined for oxidation and reduction activity as a function of space velocity, water gas shift activity, and susceptibility to poisoning by sulfur dioxide. Hydrocarbon conversion with nickel aluminate is superior to zinc aluminate solid solutions under overall reducing conditions. Copper manganate containing catalysts are poisoned by SO₂ faster than copper ferrite containing catalysts, but result in far less ammonia after poisoning apparently due to poisoning of water-gas shift catalytic sites. Carbon monoxide conversion over copper ferrite containing catalysts is not severely affected by SO₂ as poisoning of water gas shift catalytic sites is apparently minimal. The spinel solid solutions are doubtful candidates for automotive catalysts in either an oxidizing or reducing converter.

44236

APTIC NO. 67883

Leung, Linus and Dimitri Gidaspow

IRON OXIDE SORBENTS FOR REGENERATIVE SORPTION OF NOX. *Am. Inst. Chem. Engr., 20(5):840-846, Sept. 1974. 26 refs.*

Data on reaction rates and material balances were obtained for the regenerative sorption of nitrogen oxides on iron oxide sorbents. Supported ferric oxide removed NO_x from hot and cold gases, 20 to 350 C, containing nitric oxide in the range of 50-1000 ppm when sufficient oxygen was present. Rates of sorption and capacities increased with oxygen concentration. The sorbent was capable of regeneration with air at 400-450 C for an indefinite number of times. Although the ferric oxide sorbent showed interference with water vapor, no interference as observed with the sorption of NO using the reduced oxide. The reduced sorbent was regenerated with 1% CO, with the capacity of the reduced sorbent being a function of the preparation method. The reduced iron oxide sorbed NO more rapidly than the ferric oxide and had a higher capacity. Differential rate and capacity data were systematically obtained and correlated at 270 C for a supported ferric oxide powder to allow for a preliminary estimate to be made of the size of sorbers for a given duty. Breakthrough curves for a reduced form of the iron oxide were obtained also, thus permitting a limited scale-up of potential fixed bed sorbers for exhaust and flue gas treatment. (Author abstract modified)

44231

APTIC NO. 64664

Liederman, David, Sterling E. Voltz, and Paul W. Snyder

DEACTIVATION OF A PLATINUM MONOLITHIC CARBON/HYDROCARBON OXIDATION CATALYST. *Ind. Eng. Chem., Prod. Res. Develop., 13(3):166-172, Sept. 1974. 29 refs.*

The effects of aging on the carbon monoxide/hydrocarbon oxidation activity and important physical properties of a platinum monolithic catalyst were determined. Catalyst samples were aged to 25,000 equivalent miles at a maximum temperature of 1450 F with unleaded fuel on an engine dynamometer. The activity for the oxidation of carbon monoxide, propylene, and engine exhaust gas hydrocarbons decreased rapidly during the first 1000-1500 miles with very little additional deactivation during further aging. A large decrease in propane oxidation activity continued throughout the 25,000 miles of aging. The growth of very large platinum crystallites appeared to be a pri-

mary cause of catalyst deactivation. No significant changes in surface area or solid-state phase composition were noted. Small amounts of lead were detected on aged catalyst samples. (Author abstract)

44232

APTIC NO. 67641

Locke, H. B.

FLUIDIZED COMBUSTION FOR ADVANCED POWER GENERATION WITH MINIMAL ATMOSPHERIC POLLUTION. *J. Inst. Fuel, 47(392):190-197, Sept. 1974. 29 refs.*

Present British fluidized combustion developments are a considerable advance on previous work. Solid or liquid fuels or wastes even of very high ash and sulfur content are burned in a fluidized bed of inert particles with immersed heat transfer tubes. Combustion is efficient and of high intensity, so furnaces are of small volume. Combustion temperature is uniform and controlled and can be low to prevent ash fusion. Volatilization of sodium and vanadium compounds is inhibited, obviating corrosion of gas-turbine blades; and any remaining ash particles do not erode them or stick. Heat transfer rates are very high, so much less boiler tube surface is required; and erosion and corrosion of tubes is within limits accepted for ordinary boilers. Limestone or dolomite in the bed retains fuel sulfur so that flue gases meet forecast legal requirements without separate flue gas treatment. Production of oxides of nitrogen is significantly minimized. Also the combustion system can readily be operated under high pressure as part of advanced high efficiency gas/air/steam power generation cycles, as well as for simple steam boiler and incineration purposes. (Author abstract)

44233

APTIC NO. 67684

Maartmann, Sten

FEASIBILITY OF FINE DUST COLLECTION WITH DRY ELECTROSTATIC PRECIPITATORS. (*Möglichkeiten zur Feinstaubabscheidung mit trockenarbeitenden Elektroentstaubern*). Text in German. Staub, Reinhaltung Luft, 34(10):353-355, Oct. 1974. 13 refs.

Theoretical fractional efficiency curves for dry electrostatic precipitators follow the same trend as those for experimental measurements. A minimum efficiency can be expected in the 0.2 to 2 micron range depending on which measuring technique is used. The fractional efficiency of a dry electrostatic precipitator varies with the specific collecting area in the same way as is predicted by available precipitator theory for total collecting efficiency.

44234

APTIC NO. 67889

Maeda, Isamu and Hiromi Tanaka

FLUE GAS DESULFURIZATION BY WATER SCRUBBER AND ACTIVATED CARBON. (*Suisen desurishiki kasseitanho ni yoru haigasu datsuryu sochi*). Text in Japanese. (Sumitomo Heavy Machinery Co., Tokyo (Japan)) Japan. Pat. Sho 49-27746. 3p., July 20, 1974. (Appl. Oct. 15, 1970, 1 claim).

The processes of absorption, removal, and drying for the desulfurization of exhaust gases by activated charcoal can be carried out continuously in one piece of equipment, with automatic controls, so the operational cost is reduced markedly. The scrubber is fitted with two intake and output openings for the untreated gas (one above, one below), with a switching damper for using either opening for intake or output. Within the vessel, two porous shelves are placed, one above the other, at a suitable distance from each other. Activated charcoal is piled on these shelves for the scrubbing operation. Spray nozzles are placed above the charcoal layers for the washing operation. Shelves for collecting waste water are built in beneath the charcoal shelves at a slight angle to facilitate collection of waste water. Holes are made in the upper waste water shelf and individually covered by trays, so that the untreated gas can be passed through the scrubber in an upward

or a downward direction, while the waste water belonging to the top charcoal layer will not drip down on the bottom charcoal layer. The direction of untreated gas flow is reversed when the activated charcoal begins to lose its absorption capacity. While one charcoal layer is being cleaned by washing, the other charcoal layer is absorbing the sulfur oxides from the untreated gas. A schematic diagram of the scrubber is included.

44236

APTIC NO. 67501

Menchen, William R. and David F. Becker

ENVIRONMENTAL IMPACTS FOR THE ENERGY SUPPLY SYSTEM ASSOCIATED WITH HIGH BTU COAL GASIFICATION. Preprint, American Chemical Society, Washington, D. C., 15p., 1974. 4 refs. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., March 31-April 5, 1974.)

The quantitative environmental impacts associated with fossil fuel supply chains are discussed. The specific chain examined consists of the extraction, transport, processing, distribution, and conversion activities required to produce high Btu, synthetic natural gas from Western coal. The analysis of the energy supply chain was made on a process basis. Impacts are expressed in terms of the energy input to each process. Since the information given is in part derived from a much larger data base, which has not been published yet, the complete data base is briefly described. Environmental impacts examined include air and water pollutants, solid waste, and land use. Primary and ancillary energy requirements (efficiencies) are examined in addition to the costs associated with each process in the high Btu gas energy supply chain. Environmental impacts are presented for the case of gas produced at a mine mouth using Western coal, gas made in the Chicago area using Western coal, and the current natural gas supply system. (Author abstract modified)

44236

APTIC NO. 67917

Miyamoto, Seichi and Hinrich L. Bohn

FILTRATION OF AIRBORNE PARTICULATES BY GRAVEL FILTERS: I. INITIAL COLLECTION EFFICIENCY OF A GRAVEL LAYER. *J. Air Pollution Control Assoc.*, 24(11):1051-1054, Nov. 1974. 7 refs.

Gravel filters have been proposed as useful filters of dust-laden gas streams having the advantages of corrosion and temperature resistance, physical robustness, and ease of cleaning. Their filtration properties are little known, however. A derivation is presented of the initial or media collection efficiency as a function of gravel size, gravel layer thickness, and Darcy gas flow velocity. In the equation for initial collection efficiency (E_0) of a gravel bed filter, $-\ln(1 - E_0)$ is proportional to the thickness of the gravel layer, to the $-5/3$ power of the diameter of uniform gravels, and to the $-2/3$ power of the Darcy airflow velocity. The experimental data obtained from ammonium chloride fume removal from dry air at room temperature by sieved gravel fractions generally supported the equation, except that the effect of mean gravel size was represented by the -1.43 power of the average diameter. The proposed equation should be useful within the tested range for predicting the effects of gravel layer thickness and flow velocity on the initial collection efficiency. The effect of nonuniform gravel size and shape on the initial collection efficiency requires further investigation. Until then, the present experimental value may serve as a rough estimate. (Author summary modified)

44237

APTIC NO. 67707

Muermann, H.

DUST REMOVAL FROM FLUE GASES.

(Rauchgasentstaubung). Text in German. *Wasser Luft Betrieb*, 18(10):539-544, 1974.

More stringent regulations concerning air conservation have made dust collection necessary not only in large boiler plants but also in small and medium sized units. Even the flue gases

of large central heating systems must be cleaned from dust now. While in large boiler units the electrostatic precipitator is the preferred dust collector, mechanical dust collectors of centrifugal design are primarily installed in small and medium units. The operating principle of these collectors is reviewed. Individual cyclones are manufactured in varying sizes, for example with diameters of 400, 450, 500, 560 and 630 mm and air throughputs from 1200 to 4000 cu m/hr. They can be combined with larger-size units for cleaning any desired quantity of gas. In the Babco multi-cyclone the dust is separated in two steps, firstly through the rotation of the gas in the cyclone and secondly through deflection of the gas flow at the entrance into the slotted central tube. Another centrifugal separator consisting of a number of smaller cyclones is the amerclone. This collector has a primary and secondary collection system. Both systems can be combined in one unit for gas flows of 10,000 to 120,000 cu m/hr. For smaller gas flows of 250 to 800 cu m/hr only the secondary system is used. The primary system consists of cells each containing nine cyclones with a conical and cylindrical part. The cyclones in the secondary system are cylindrical sheet steel tubes with a diameter of 100 mm and a length of 390 mm which primarily remove the fine dust. A centrifugal dust collector is described and illustrated which is used for cleaning flue gases from central heating systems. The collector is of small space saving design and comprises two modules which can be combined to any required capacity. The first module houses two cyclones and has a capacity of 1600 cu m/hr. The larger module accommodates four cyclones and has double the capacity.

44238

APTIC NO. 67621

Nakao, Yasushi

A SMOKE PREVENTION DEVICE FOR THE REVOLVING FURNACE. (Tenro no boen sochi ni tsuite). Text in Japanese. *Nippon Kogyo Kaishi (J. Mining Met. Inst. Japan)*, 90(1035):351-352, 1974.

To prevent smoke leakage from revolving furnaces in copper factories, the revolving furnace system was redesigned and a new outer hood and inner hood were installed. The inner hood is equipped with a water cooling jacket operated at 60-70 ton/hr water flow rate, 45 C water inlet temperature, and 65 C water outlet temperature. The heat emission quantity from the jacket was in the range of 30-40 Mcal/sq m hr. After one year of operation, no sign of corrosion or deformation was found. A new cylindrical dust chamber instead of the old box type chamber with bottom hopper was installed, and the heat emission quantity from the dust chamber was 600 Mcal/hr and no leak was found. One operational period is 2 mo, and 20 tons of smoke ashes are collected in the dust chamber.

44239

APTIC NO. 67521

Nelson, P. A., E. C. Gay, R. K. Steunenbergh, J. E. Battles, W. W. Schertz, D. R. Vissers, K. M. Myles, D. S. Webster, and L. Burris

DEVELOPMENT OF HIGH-SPECIFIC-ENERGY BATTERIES FOR ELECTRIC VEHICLES. PROGRESS REPORT FOR THE PERIOD AUGUST 1973 - JANUARY 1974. Argonne National Lab., Argonne, Ill., Chemical Engineering Div., 39p., June 1974. 27 refs.

NTIS: ANL-8058

Results are reported from research efforts to develop a high-specific-energy lithium/sulfur battery having the performance characteristics required for powering pollution-free automobiles. Performance goals for a single cell include a capacity density of 0.3 A-hr/sq cm at a current density of 0.15 A/sq cm, a peak power density of 1-3 W/sq cm, and a minimum cycle life of 1000 cycles. Cells with negative electrodes of liquid lithium and positive electrodes of iron sulfide-lithium sulfide mixtures in graphite housings can achieve short-time peak power densities as high as 1.4 W/sq cm and can sustain power densities up to 0.6 W/sq cm for approximately 30 sec. Capacity densities as high as 0.38 A-hr/sq cm are possible upon charging at a current density of 0.025 A/sq cm and discharging

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at 0.1 A/sq cm. The operation of several cells for more than 500 hr and 100 cycles with only moderate declines in capacity density over the cell lifetime is reported. Further improvements are needed in cell design to increase sulfur utilization and cell lifetime. (Author abstract modified)

44340

APTIC NO. 67497

Newhall, Henry K.

LOW EMISSIONS COMBUSTION ENGINES FOR MOTOR VEHICLES. Preprint, American Chemical Society, 24p., 1974. 29 refs. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., March 31-April 5, 1974.)

A review of the underlying concepts and current status of unconventional motor vehicle engines employing modified combustion as a means for emission control is presented. As an alternative to conventional internal combustion engines equipped with exhaust treatment devices, modified combustion engines can, in principle, yield large reductions in vehicle exhaust emissions. Such modifications include stratified charge engines of both open and dual chamber design and diesel engines. Prototype stratified charge engines can achieve low exhaust emissions with fuel economy superior to that of conventional engines controlled to similar emissions levels. Results from Environmental Protection Agency emissions tests with a Honda stratified charge engine show that 1975-76 hydrocarbon and carbon monoxide standards can be met with the 1976 nitrogen oxide standard being closely approached without additional emission control. Although diesel engines can achieve low HC, CO, and NOx levels, potential problems include excessive particulate and odorant emissions. Other power plants based on continuous combustion processes such as the Rankine engine, the gas turbine, and the Stirling engine also have potential for very low exhaust emissions, though problems in manufacturing costs, reliability, durability, vehicle performance, and fuel economy must be overcome.

44341

APTIC NO. 67918

O Neal, A. J., Jr.

VANADIUM RECOVERY FROM THE COMBUSTION OF VENEZUELAN FUEL OIL. *Combustion*, 46(5):18-21, Nov. 1974. 1 ref.

The experiences of the Long Island Lighting Company with vanadium recovery from the combustion of Venezuelan fuel oil are reviewed. The equipment and technology used in recovery of high-grade furnace ash are described. An experimental technique is described for converting low-grade vanadium residues into high-grade furnace ash at relatively low cost. All these processes are aimed at two factors important to the nation's economy and physical well-being of the people -- the metallic oxides are prevented from polluting the atmosphere and they are recovered for re-use, thus recycling a valuable and diminishing resource.

44343

APTIC NO. 67586

Okada, Seishi

COUNTERMEASURES AGAINST AND CAUSES OF BAD ODORS OF WASTE WATERS. (Hainui ni okeru akushu to sono taio) Text in Japanese. PPM (Japan), 5(10):38-47, Oct. 1974. 8 refs.

The methods of treatment of odorous waters are discussed. Characteristics of the odorous substances are given. The nature of odors issued from water, the mechanism of evolution of odor from aqueous solutions, and methods to deodorize waste water are presented. Substances associated with bad odors are ammonia, trimethylamine, hydrogen sulfide, methyl mercaptan, and methyl sulfide. Simple stirring of solutions and bubbling with stirring affect the evaporation of the odorous substances in a different way. The temperature of the solutions also plays an important role in evaporation. Possible methods of deodorization of odorous solutions are the adjustment of pH, oxidation with chlorine, ozone, or nitrogen ox-

ides, chemical reactions with metals such as iron, biological treatment, and deodorization with active carbon or ion exchange resins. The addition of active sludge is effective in reducing the odor of waste water.

44343

APTIC NO. 67813

Osag, T. R. and G. B. Crane

CONTROL OF ODORS FROM INEDIBLES-RENDERING PLANTS. Office of Air and Waste Management, Research Triangle Park, N. C., Emissions Standards and Engineering Div., Rept. EPA-450/1-74-006, 60p., July 1974. 55 refs.

NTIS: PB 237342/AS

Odor control for the inedible animal and poultry rendering industry is reviewed. Topics covered include: different types of rendering processes, points of emission and chemical characteristics of such emissions, health effects of odors, odor control techniques, and methods of estimating capital investment and total annual cost for odor control equipment. Major control techniques for reducing odors include: condensers, afterburners, and scrubbers. Rendering-plant odors are attributed to such classes of compounds as aldehydes, fatty acids, amines, mercaptans, and sulfides. The influence of odors on the health and welfare of individuals is difficult to assess due to the lack of an objective measurement technique. No data are available to relate odors by themselves to any specific organic disease, and odors bear no relationship to the toxicity of a gas.

44344

APTIC NO. 67518

Pangborn, J. B., J. C. Gillis, and E. Beyma

FEASIBILITY STUDY OF ALTERNATIVE FUELS FOR AUTOMOTIVE TRANSPORTATION. Preprint, Inst. of Gas Technology and Environmental Protection Agency, 26p., 1974. 11 refs. (Presented at the Alternative Automotive Power Systems Coordination Meeting, 7th, Ann Arbor, Mich., May 16, 1974.)

The technical and economic feasibility of alternative fuels for automotive transportation is assessed. The major emphasis in the selection of an alternative fuel is based on its long-term availability from domestic sources. Economics, competition with other energy applications for limited energy resources, safety, handling, environmental impacts, and system compatibility are taken into account. This study is limited to chemical fuels, and, except for fuel cell vehicles which use a chemical fuel, electric vehicles are excluded. A brief summary of the applicable domestic resource base is presented, with the pertinent chemical and physical properties of potential alternative fuels, and a discussion of the selection of candidate alternative fuels. The most promising alternative fuels are synthetic gasoline and hydrocarbon distillates. Methanol is the next most attractive liquid fuel. Further, more detailed comparisons between methanol and synthetic gasolines are justified. Hydrogen is a speculative fuel which will become more attractive as fossil carbon resources are depleted.

44345

APTIC NO. 67680

Paulmier, Claude

THE EFFECT OF VARIABLE FUEL DISTRIBUTION IN VALVE-CONTROLLED INTERNAL COMBUSTION ENGINES ON POWER OUTPUT AND GASEOUS POLLUTANT EMISSIONS. (Distribution variable pour moteur a combustion interne a distribution par soupape. Effets sur les performances et les emissions de gaz polluants a l'echappement). Text in French. Ingr. Automobile, Paris, no. 6-7:442-452, June-July 1974. 10 refs.

The effect of variable valve timing on the hydrocarbon, nitrogen oxides, and carbon monoxide emissions from internal combustion engines was studied. Both valve overlap and advance ignition angle have considerable influence on the exhaust emissions. An ignition advance of 12° at 1500 rpm resulted in a reduction by about 80% in the unburned hydrocarbon emissions, and an increase in the nitrogen oxides

emission by 65% at a CO emission of 1%. The nitrogen oxides emission increases with decreasing air-excess coefficient rather moderately when advance ignition is applied.

44246

APTIC NO. 67631

Peyer, Stefan

RECOVER CHLORINE FROM HCL. *Hydrocarbon Process.*, 53(11):147-150, Nov. 1974. 2 refs.

An electrolysis process is discussed for producing pure chlorine from waste hydrogen chloride for about \$15/ton. The process is 98% efficient. The process can be used to convert waste HCl gases produced during the production of polyvinyl chloride to chlorine which can be used in the manufacturing process. The petrochemical reactions involved in the process, the process itself, the raw material properties, power consumption, product costs, and commercial plants are described.

44247

APTIC NO. 67891

Peters, Werner and Hans-Dieter Schilling

FUTURE ORIENTED COUPLING AND COMBINATION SYSTEM FOR COAL REFINING. (*Zukunftsorientierte Koppel- und Verbundsysteme zur Kohleveredlung*). Text in German. *Chemiker-Ztg. (Heidelberg)*, 98(9):431-438, 1974. 30 refs.

The successful development of the high-temperature nuclear reactor makes gasification of coal with the aid of process heat from nuclear reactors feasible. For Europe this will mean savings of expensive coal of up to 30 or 40% over conventional gasification processes and less environmental pollution. The remote supply of nuclear heat by means of latent chemically bound heat has also become feasible. The combination of a coal pressure gasification process with a gas steam turbine process has for the first time been realized in the power plant Kallermann in Lünen, Federal Republic of Germany. The schematic diagram of this combined process is given. Hard coal is gasified under pressure. The developing gas is cleaned from dust and tar components. The sulfur compounds (hydrogen sulfide) are removed as well. The gas with the water vapor from the scrubbing process goes to a turbine where the gasification pressure is reduced to one half of its value and next to the steam boiler for combustion. The combustion gas is cooled to the entrance temperature of the gas turbine (about 830 C). The other part of the heat goes in the form of steam to the steam turbine. Another method of improving coal power plants is provided by the fluidized bed technique.

44248

APTIC NO. 67721

Phillips, Nancy P. and R. Murray Wells

SOLID WASTE DISPOSAL (FINAL REPORT). *Radian Corp., Austin, Tex., Environmental Protection Agency Contract 68002-1319, Program Element IAD013, ROAP 21ADE-10, Task 4, Rept. EPA-650/2-74-003, 313p., May 1974. 179 refs.*

NTIS: PB 233144/AS

Disposal technologies and environmental aspects for nine solid wastes destined for land disposal are examined to identify available technologies developed in other industries that may be applicable to the disposal of scrubber sludge generated by flue gas desulfurization systems for sulfur oxide control. The results of the study indicate that much of the technology already developed for ponding of phosphate slimes, by-product gypsum, taconite tailings, coal ash, and acid mine drainage sludge is applicable to scrubber sludge disposal by ponding. Technologies developed in the area of land disposal of sewage sludge, coal ash, and possibly acid mine drainage sludge that is removed from sludge ponds during desludging operations may be applicable to scrubber sludge disposal, particularly in cases where fixation technology has been applied. Alternative disposal methods available for scrubber sludge, including deep mine disposal, strip-mined land reclamation, and utilization possess some degree of potential. No insurmountable technological problems exist for scrubber sludge disposal

based on presently available data. (Author conclusions modified)

44249

APTIC NO. 67780

Puhr-Westerheide, H.

POWER PLANTS WITH COAL PRESSURE GASIFICATION. (*Kraftwerke mit Kohledruckvergassung*). Text in German. *VGB Kraftwerkstechnik*, 54(8):532-536, Aug. 1974.

For the first time in the Federal Republic of Germany the combined gas steam turbine process with preceding coal pressure gasification has been realized in the power plant Lünen. The gas from coal pressure gasification is burned in a steam generator at high overpressure. A gas turbine is installed in the flue gas path where the temperature is between 800 and 1000 C. The steam produced is used in a conventional steam turbine set. The compressor of the gas turbine set supplies the gasification and combustion air. The gas from coal gasification is cleaned in a scrubber system to remove dust and tar residues. Subsequently the sulfur content is reduced by 90%. The power plant produces 170 MW, 74 MW coming from the gas turbine and 96 MW from the steam turbine. The entire power plant has been in operation for 3000 hr. The operating experiences to date are described in detail. The gas cleaning system failed to reach the guaranteed efficiency. The tar separator is presently being modified and enlarged. The hydrogen sulfide from the desulfurization plant is processed in a Claus plant to obtain elemental sulfur. Despite the present shortcomings, the dust emission is far lower than that of fossil fuel-fired power plants, the oxides of nitrogen emission is also far lower, and the desulfurization plant not only removes the sulfur dioxide content but also the fluorine content of flue gases.

44250

APTIC NO. 67897

Robbins, Donald D.

CYCLONIC COMBUSTION BURNER. (*Assignee not given.*) U. S. Pat. 3,804,578. 7p., April 16, 1974. 3 refs. (*Appl. Oct. 10, 1972, 5 claims.*)

A compact cyclonic burner which burns liquid or gaseous fuels at a higher temperature than prior art burners and thus improves the extent of combustion and pollution reduction is described. The apparatus consists of a circular housing with walls having spaced secondary slotted air inlets arranged to extend between the top and bottom of the burner for injecting air into the burner tangentially to the wall of the housing and along its inside periphery. Fuel inlet means are connected to the housing and disposed to inject fuel into the housing tangentially to its inside wall, while a fuel ignition means is situated adjacent the inlet. The secondary air combines more readily with the liquid or gaseous burning fuel during the combustion process due to the arrangement of air inlets and aids the vaporization, distillation, gasification, and oxidation of the burning fuel.

44251

APTIC NO. 67524

Ryby, C. B., C. A. DeFazio, I. K. Shahidi, J. C. Trebellas, and J. A. Vona

ENERGY CONSERVATION IN COATING PROCESSES. *Am. Chem. Soc., Div. Org. Coatings Plast. Chem., Preprints*, 39(1):39-46, April 1974. 7 refs.

The concept of ultraviolet curable coatings (U.V. curing) is reviewed in relation to energy consumption reduction and virtual elimination of air pollution. The components of an ultraviolet curable formulation generally include an unsaturated resin, a multifunctional monomer, and a photoinitiator. Acrylated polyethers, acrylated polyester-based urethanes, methacrylated polyesters, and acrylated epoxies are examples of the varieties of resins suitable for such systems; data are given on their properties when crosslinked with multifunctional acrylates. Examination of the coating and application costs of typical ultraviolet cure formulations versus comparable thermal systems indicates that cured coatings are competi-

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tive up to approximately a 1.0 mil coating thickness, with the economic situation changing in favor of ultraviolet curing as fuel costs increase and better price/performance resins are developed. Presently ultraviolet curing finds its greatest application for thin coatings, 0.2 mil or less, as in printing inks and decorative can coatings.

44252

APTIC NO. 67640

Salooja, K. C.

IMPROVED CONTROL OF SMOKE, COMBUSTION EFFICIENCY AND FLAME STABILITY. *J. Inst. Fuel*, 47(392):203, Sept. 1974. 1 ref.

A novel means of achieving improvement in smoke control, combustion efficiency, and flame stability in refinery flares and some industrial firing systems is presented. The method simply involves air injection directly into the flame. Studies were carried out on a 1.5-1.8 m tall flare burning liquefied petroleum gas and on a 25 mm inside diameter burner. The effects of injection steam into the base of the flame, air fully premixed with fuel, air through nozzles and around the burner tube, and air directly into the flame were compared.

44253

APTIC NO. 67901

Sata, Naoyasu

NEW INTERNAL COMBUSTION ENGINE ACTUATOR FLUID PRODUCING NO NITROGEN OXIDE IN EXHAUST GASES, ITS MANUFACTURING METHOD AND AN APPARATUS THEREFOR. (Assignee not given.) *U. S. Pat.* 3,800,761. 6p., April 2, 1974. 5 refs. (Appl. May 10, 1971, 10 claims).

The manufacture of an actuator fluid which replaces air fed to the carburetor and precludes motor vehicle nitrogen oxide emissions is described. The actuator fluid is produced by heating liquid oxygen and a liquid or solid inert gas other than nitrogen, such as carbon dioxide, in separate closed containers sealed from the external atmosphere in order to gasify the actuator components. The two gases are then led to a mixing unit to be uniformly mixed at a predetermined mixing ratio, preferably 1:4 O₂/CO₂ which is the same ratio as exists for O₂ and N₂ in the normal atmosphere. The internal combustion engine which utilizes the actuator fluid fed to the carburetor in place of air can be a conventional engine without any modification or change in engine structure. (Author abstract modified)

44254

APTIC NO. 67630

Schreiner, W. C., A. E. Cover, W. D. Hunter, C. P. van Dijk, and H. S. Jongenburger

OXIDIZE HCL FOR CHLORINE. *Hydrocarbon Process.*, 53(11):151-156, Nov. 1974. 4 refs.

The Kel-Chlor process is described. It converts hydrogen chloride to chlorine by oxidation with oxygen through a chemistry route involving nitrogen oxide compounds through a circulating sulfuric acid system. The process is not limited to a single set of design operating conditions, i.e., pressure, temperature, acid circulation rate; and nitrogen oxides concentration. Several design versions have been developed to match almost any existing HCl conversion case. Sizes are available from 20 to more than 600 tons/day, and costs range from \$22 to \$55/ton of chlorine produced. The Kel-Chlor process overcomes the conversion limits of prior methods using the Deacon reaction by operating at a lower temperature with sulfuric acid to absorb water as it is formed. The chemical reactions in the Kel-Chlor process, yields, operating conditions, wastes, construction materials, economics, operating characteristics, and applications are described. The process can be used to convert by-product HCl which causes a waste disposal problem into Cl₂. It can also be used for producing insecticides, isocyanates, carbon tetrachloride, fluorocarbons, vinyl chloride, and linear olefins.

44258

APTIC NO. 67995

44255

Schwarz, Gerald L. and Hugo Schlachet

LIQUID SPRAYER. (Bessam Manufacturing, Inc., Cleveland, Ohio) *U. S. Pat.* 3,798,881. 6p., March 26, 1974. 5 refs. (Appl. July 22, 1971, 9 claims).

An apparatus for filtering, cleaning, and cooling gases is described which spreads a more uniform curtain of water vapor across the cleansing and cooling chamber than prior art devices of similar nature. Gases are conducted through an inlet to chamber containing a foraminous wall extending transverse to the direction of gas flow. Some means such as a fan is used to force the gas through the foraminous wall. A pool of water stands in the bottom of the chamber between the inlet ducting and the foraminous wall, and a curtain of the water is sprayed from the pool by means of rotating discs and directional control mechanisms such that gas entering the chamber passes through the water curtain and is cleaned and cooled. (Author abstract modified)

44256

APTIC NO. 67570

Sensei, Teizo

EXHAUST GAS DESULFURIZATION. (Haiei datsumy ko). Text in Japanese. *Kagaku Kojo (Chem. Factory)*, 18(9):58-59, Sept. 1974.

Heavy oil of 1% sulfur content must be used to reduce the concentration of SO_x released from C heavy oil of 2.6% sulfur content by 40%, while 0.2% heavy oil must be used to reduce it by 90%. The difference in price, in this case, is \$25.40/kl and \$58.30/kl respectively. What is more important is the fact that 3 to 5% of the total petroleum to be treated is consumed in the conversion of a high-sulfur fuel to a low-sulfur one. Though liquid natural gas meets the necessity of reducing SO_x concentration, it is insufficient to meet that of reducing the concentration of nitrogen oxides. A method of eliminating SO_x and NO_x simultaneously by 99.5% and 90% respectively has been developed. This method will guarantee a profit of \$19.00/kl, when compared with the fuel conversion mentioned above.

44257

APTIC NO. 67515

Stebar, R. F. and F. B. Parks

EMISSION CONTROL WITH LEAN OPERATION USING HYDROGEN-SUPPLEMENTED FUEL. *Preprint, Society of Automotive Engineers, New York*, 16p., 1974. 16 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress, Detroit, Mich., Feb. 25-March 1, 1974, Paper 740187.)

Hydrogen-supplemented fuel is investigated as a means of extending lean operating limits of gasoline engines for control of nitrogen oxides. Single-cylinder engine tests with small additions of hydrogen to the fuel resulted in very low NO_x and carbon monoxide emissions for hydrogen-isooctane mixtures leaner than 0.55 equivalence ratio. Significant thermal efficiency improvements resulted from the extension beyond isooctane lean limit operation. However, hydrocarbon emissions increased markedly at these lean conditions. A passenger car was modified to operate at 0.55-0.65 equivalence ratio with supplemental hydrogen. Vehicle emissions, as established by the 1975 Federal Exhaust Emissions Test, demonstrated the same trends as the single-cylinder engine tests. The success of the hydrogen-supplemented fuel approach will ultimately hinge on the development of both a means of controlling hydrocarbon emissions and a suitable hydrogen source on board the vehicle. Reported efforts to develop a satisfactory onboard hydrogen generator (gasoline reformer) appear restricted by fuel economy considerations. (Author abstract)

44258

APTIC NO. 67585

Tagawa, Taichi

COUNTERMEASURES AGAINST BAD ODORS BY CATALYTIC OXIDATION. (Shokubai sanko ho ni yori akushu taisaku). Text in Japanese. *PPM (Japan)*, 5(10):18-27, Oct. 1974. 3 refs.

A discussion is presented on the catalytic oxidation of odorous substances, the classification of catalysts and the determination of catalysts for special purposes, the temperature of the catalyst layers and the flow rate of gases, the life of catalysts, the apparatuses used for the treatment, and economy of catalytic oxidation installations. Examples of practices are also given. The most important feature of the catalytic oxidation method is that it is performed at lower temperatures. Low temperatures allow the use of common furnace materials. The life of a catalyst is dependent upon wear and breakage, coating by dusts, physical adsorption, chemical changes, transformation, crystallization, and melting of catalysts. Care must be taken to avoid these deteriorating effects. The waste gases to be treated are introduced in the catalyst layer usually through a filter. The gas is then led to a preheating chamber, and then to the reacting vessel. The treated gas is then discharged after heat recovery. Popular catalysts used for this practice are palladium, platinum, cupric oxide, nickel oxide, ceric oxide, titanium dioxide, vanadium pentoxide, and ferric oxide.

44259

APTIC NO. 67982

Thompson, Albert L.

EXHAUST GAS RECIRCULATION VALVE. (*General Motors Corp., Detroit, Mich.*) U. S. Pat. 3,800,765. Sp., April 2, 1974. 4 refs. (Appl. Nov. 17, 1972, 1 claim).

An improved exhaust gas recirculation valve for automotive emission control systems employing exhaust gas recirculation is described, with particular reference to its dual diaphragm nature which permits response to both the pressure signal created at an induction passage slot traversed by the edge of the throttle and to the manifold pressure. The two diaphragms are of different effective mass defining a manifold pressure chamber therebetween. Upon an increase in manifold pressure, the valve opening force is increased by a force proportional to the increase in manifold pressure. The greater flow area through the valve thereby provided compensates for the reduced pressure differential in the recirculation passage and the reduced residual fraction in the combustion chamber to provide the desired dilution of the air-fuel mixture.

44260

APTIC NO. 67948

Tokuhisa, Yoshiro

CLOSED SYSTEM OF PETROLEUM REFINERIES. (*Seikiyo seisei no kurozudo shisutemuka*). Text in Japanese. *Nenryo Kyokaihi (J. Fuel Soc. Japan (Tokyo), 53(568):701-709, Aug. 1974.*

The concept and definition of closed system refineries (pollution-free refineries) for Japan are discussed along with possible approaches to establishing such plants. Energy consumption per unit area of flat land in Japan is approximately 10 times that of the United States; over 70% of Japan is mountainous, making the construction of petroleum refineries extremely difficult. Postwar economical growth has complicated the problem of energy requirements. An example is given to illustrate a possible approach to the construction of closed system refineries.

44261

APTIC NO. 67670

Valentine, John P.

NEW SOLVENT PROCESS PURIFIES CRUDE, COAL ACID GASES. *Oil Gas J.*, 72(46):60-62, Nov. 18, 1974. 2 refs.

Worldwide concern over pollution and shortages of light hydrocarbons have led to study of other feedstocks such as heavy crude oils and coal for fuel gases. A new solvent process is described which can selectively absorb sulfur gases and remove large quantities of acid gases. The solvent can be used in synthesis gas, bulk removal of acid gas, and selective absorption of sulfur gases such as hydrogen sulfide and carbonyl sulfide. A coal gasification scheme using the solvent process to remove acid gases and sulfur gases is described.

The absorption characteristics of the Selexol solvent are considered for the following gases: carbon dioxide, H₂S, COS, ammonia, and hydrocarbons. The importance of the solvent process in the economic design of gas purification systems is reviewed.

44262

APTIC NO. 67998

Vincent, Clifford A.

DUST COLLECTION SYSTEM. (*Consolidated Rock Products Co., Los Angeles, Calif.*) U. S. Pat. 3,799,221. 7p., March 26, 1974. 4 refs. (Appl. Oct. 4, 1972, 11 claims).

A dust collection system for use in the filling of mobile cement mixers is described. The system includes a hopper having a conduit for transport of materials to the mixer, a seal which surrounds the outlet of the conduit and engages the inlet of the mixer, and an exhaust duct having an inlet which faces the interior of the mixer and an outlet for connection to a source of suction. Application of suction to the exhaust duct during filling of the mixer removes the dust generated during the filling of the mixer. The hopper may be used in conjunction with an aggregate dispenser having a seal which contacts the periphery of the hopper inlet and an exhaust manifold which aids in exhausting dust and the air displaced during the filling operation. (Author abstract modified)

44263

APTIC NO. 67987

Walker, Alan B.

EXPERIENCE WITH HOT ELECTROSTATIC PRECIPITATORS FOR FLY ASH COLLECTION IN ELECTRIC UTILITIES. *Combustion*, 46(5):14-17, Nov. 1974. 10 refs.

Operating experience with over 30 fly ash precipitators on utility steam generating units, ranging in size from 30 MW to 1000 MW, is described. Operating temperatures on these units ranged from 630 to over 900 F; operating service ranged from 2 to 38 months. Approximately 60 full-scale performance tests were run on 19 different steam generating units in 11 different plants. Actual performance data on all commercial scale installations tested to date are presented. A specific collecting area in the range of 180 to 300 sq ft/1000 acfm will achieve 99% removal and specific collecting areas of 230 and 400 are required for 99.8% removal. Power density effects and physical reliability aspects of the precipitators are reviewed. From a high efficiency standpoint, hot-type precipitators are highly reliable and can be designed with a much higher degree of certainty than cold precipitators because the probability of encountering high resistivity operating conditions is sharply reduced. Structural and mechanical design of hot precipitators requires careful attention to designs which minimize temperature gradients and allow for differential thermal expansion where such temperature gradients cannot be avoided. Hot-type precipitators have an economic advantage over cold-end units under situations where the cold-end units must be designed for operation under high resistivity ash conditions. Hot-type precipitators appear to have a performance reliability advantage over cold precipitators in high resistivity situations. (Author conclusions modified)

44264

APTIC NO. 67481

Wedding, Brent and Robert J. Farrauto

RAPID EVALUATION OF AUTOMOTIVE EXHAUST OXIDATION CATALYSTS WITH A DIFFERENTIAL SCANNING CALORIMETER. *Ind. Eng. Chem., Process Design Develop.*, 13(1):45, Jan. 1974. 5 refs.

A differential scanning calorimeter screening test for automotive exhaust oxidation catalysts is described. The sample is heated in a flowing gas environment, and its temperature rise relative to an inert reference is used as a measure of activity. An experimental run requires 0.5 hr, and a laboratory technician can easily attend more than one instrument during the routine analyses. Results are presented from catalyst degrada-

tion and poisoning studies and experiments to determine the oxidation kinetics of carbon monoxide by a copper oxide-chromium oxide catalyst. The differential scanning calorimeter is particularly useful for examining catalyst poisoning resistance; some information about reaction kinetics can also be obtained from data generated by the device. Although detailed agreement between differential scanning calorimeter results and those of more sophisticated experiments is not always found, there is good correlation of general performance trends, with samples showing poor DSC response also showing poor performance on either bench or engine tests.

44265

APTIC NO. 67916

Wendt, J. O. L. and C. V. Sternling

EFFECT OF AMMONIA IN GASEOUS FUELS ON NITROGEN OXIDE EMISSIONS. *J. Air Pollution Control Assoc.*, 24(11):1055-1058, Nov. 1974, 12 refs.

The effect of ammonia in the fuel on nitrogen oxide emissions was investigated through laboratory experiments and field burner tests. The degree of conversion of ammonia to NOx was a strong function of excess air, ammonia content in the fuel, and the degree of mixing in the flame. In premixed laboratory flames, concentrations of NOx above the peak equilibrium amounts were produced. In furnace diffusion flames, the conversion to NOx was much less. At sub-stoichiometric air-fuel ratios, all the ammonia appeared to pyrolyze, forming nitrogen and only very little NOx. Several methods for burning ammonia to produce low NOx emissions were investigated. (Author abstract)

44266

APTIC NO. 67493

Wentworth, J. T.

EFFECTS OF COMBUSTION CHAMBER SHAPE AND SPARK LOCATION ON EXHAUST NITRIC OXIDE AND HYDROCARBON EMISSIONS. Preprint, *Society of Automotive Engineers*, New York, 11p., 1974, 18 refs. (Presented at the Society of Automotive Engineers Combined Commercial Vehicle and Fuels and Lubricants Meetings, Chicago, Ill., June 17-21, 1974, Paper 740529.)

The effects of combustion chamber shape and spark location on exhaust nitric oxide and hydrocarbon emissions from a single cylinder, four-stroke, reciprocating spark ignition engine were investigated, using a total of 21 spark locations and three combustion chamber configurations. The chamber shapes included a modified wedge, a disc, and a modified hemisphere. The engine was operated at constant speed and airflow, with optimum spark timing and peak NO air-fuel ratio. Variations of NO concentration with spark location ranged from 9% with the hemispherical chamber to 35% with the disc chamber, with the latter producing an NO concentration lower than either the production or hemispherical chambers. Variations of HC with spark location ranged from 27% with the hemispherical chamber to 81% with the disc chamber. Minimum HC concentrations for the three chambers were the same. A single spark location was found that produced minimum or near minimum values of both NO and HC concentrations with the production chamber and the disc chamber; no satisfactory compromise location was found in the hemispherical chamber. Prediction of how spark location and chamber shape will affect exhaust emissions in a new combustion chamber is limited by insufficient knowledge.

44267

APTIC NO. 67692

Yamagishi, K., M. Nozawa, T. Yoshie, T. Tokumoto, and Y. Kakegawa

A STUDY OF NOx EMISSION CHARACTERISTICS IN TWO-STAGE COMBUSTION. *Combustion Inst., Pittsburgh, Pa., Proc. Int. Symp. Combust., 15th, Tokyo, Japan, 1974, p. 227-228, (Aug. 25-31.)*

Nitrogen oxide emission characteristics were studied in a two-stage combustion apparatus using methane gas. The modified two-stage combustion process was divided into a primary and

a secondary stage, with about 50-70% of the stoichiometric air being supplied to the primary combustor to complete the partial combustion. Varying the premixed rate changed NOx emissions in the exhaust gas significantly, although the main components of the partially combusted gas were almost unaffected. Considerable amounts of hydrogen cyanide and ammonia were formed as intermediate species through the primary combustion and occasionally even exceeded the NO concentration in this region. The increment of nitrogen compounds in the primary combustion was comparable to the increment of NOx in the exhaust, indicating that HCN and NH3 were converted to NOx by the secondary combustion. The use of secondary combustion in the vicinity of a water-cooled wall in the combustion chamber reduced the formation of NOx by more than 50%. Nickel catalysts used in the primary combustion stage also decreased NOx emission levels as well as nitrogen compounds in general. The system can be applied to boilers.

44268

APTIC NO. 67593

Yanagihara, Shigeru

COUNTERMEASURES FOR AUTOMOTIVE EMISSION GASES. (*Jidosha haishutsu gasu ni taisuru taisaku*). Text in Japanese. *Kankyo Gijutsu (Environ. Conserv. Eng.)*, 3(7):519-526, July 1974, 5 refs.

The 1973 and 1975 automotive exhaust emission standards are reviewed. The characteristics of exhaust emission and formation mechanisms of carbon monoxide, nitrogen oxides, and hydrocarbons in internal combustion engines for automobiles using petroleum type fuel are discussed. Various exhaust emission control devices such as the engine modification air injection device and exhaust gas recirculation are reviewed. Several models of low pollution automobiles which meet the 1975 emission standard are marketed in Japan. The emission control systems of the 1974 model Toyota, Mazda rotary engine, and Honda CVCC engine are described. The emission control by catalytic devices using a platinum catalyst in pellet form, which will be installed in more than half of the 1975 models in the U. S., is described with a discussion of its advantages and problems. The status of emission control of diesel engines is also reviewed. The future projection on emission control by the use of stratified charge engines and rotary engines is discussed based on the survey published by the Eaton Company.

44269

APTIC NO. 67886

Yoshikawa, Hajime

DEODORIZATION OF WASTE WATER FROM FEATHER PROCESSING. (*Feza haisui no akushu jokyo ni tsuite*). Text in Japanese. *Mie-ken Kogyo Gijutsu Senta Nenpo (Ann. Rep. Ind. Technol. Cent., Mie Prefect.)*, 1973 edition:38-43, Aug. 1974.

In a plant processing chicken feathers for manufacturing fertilizer, the steam-decomposition drainage is coagulated and settled by ferrous sulfate, but the elimination of organic substances is not complete and bad odor is produced. The presently used toilet deodorizer is not effective. Various treatment methods and their combinations were tested for effectiveness in deodorization. Sodium chlorite, aeration, activated carbon treatment, and combinations of these methods were tested. The results were tested by odor sensitivity test, COD counts, and iodine consumption changes. Aeration as a pretreatment for one complete day was found extremely effective from the standpoint of COD and odor elimination; for the secondary treatment, chlorine was found more satisfactory from the cost standpoint. The coagulation treatment is not effective for BOD and bad odor, but the combination of coagulation and chlorine can be very effective. Ferrous sulfate causes turbidity and consumes too much chlorine, but the use of PAC or iron chloride is more effective. The use of activated carbon as a secondary treatment after aeration is very effective but the cost is high. In addition to deodorization of drainage, improvements should be made in the feather treatment process itself, and several methods are suggested.

44270

APTIC NO. 67460

Environmental Protection Agency, Research Triangle Park, N. C., Emission Control Technology Div.

EVALUATION OF THE DRESSERATOR EMISSION CONTROL SYSTEM. Rept. 75-7AW, 7p., Aug. 1974. 1 ref.

Emission tests were performed according to Federal test procedures on a 1973 Chevrolet Monte Carlo (315 cu in. engine) and a 1973 Ford Capri (159 cu in. engine) which were equipped with a Dresserator induction system designed by Dresser Industries of Dallas, Tex. The Dresserator is essentially a variable venturi, critical flow induction system with fuel metering that allows operation of the engine at an air/fuel ratio of 18 to 18.5:1. The variable venturi design allows close control of the mass flow of air by maintaining the throat area such that a flow is choked over a wide range of engine operating speeds. Both test vehicles achieved 1975 interim emission levels, with the Capri being well within the California interim levels of .9 gpm hydrocarbons, 9.0 gpm carbon monoxide, and 2.0 gpm nitrogen oxides. The Capri produced less than half the allowable (Federal) hydrocarbon, CO, and NOx emissions with the timing set at 8 degrees positive with respect to top dead center. The Monte Carlo ran at less than two-thirds the permissible levels for hydrocarbons, NOx and CO. Nitrogen oxide emissions for both vehicles were below the 1977 level of 2.0 gpm, though neither vehicle met the 1977 hydrocarbon and CO levels.

44271

APTIC NO. 67470

Office of Air and Waste Management, Research Triangle Park, N. C., Technology Assessment and Evaluation Branch

EVALUATION OF THE YAMAHA LEAN COMBUSTION ENGINE SYSTEM - EMISSIONS AND FUEL ECONOMY. Rept. 75-8 AB, 10p., Sept. 1974. 1 ref.

Federal driving cycle emissions tests were performed on a 1975 Toyota Corolla and Toyota Celica which were equipped with Yamaha lean combustion engine systems. The carburetor and cylinder head of the Yamaha system incorporate a number of proprietary modifications to facilitate lean operation (air/fuel ratios of between 17:1 and 18:1). The exhaust manifold is insulated to elevate temperature and thereby promote hydrocarbon and carbon monoxide oxidation, with exhaust gas recirculation also being employed. The Yamaha Corolla demonstrated hydrocarbon levels below the 1976 statutory emission standards, while CO levels were 12% above these standards. Nitrogen oxide levels were consistently below the 1975 interim emission standards. The Yamaha Celica easily met the 1975 vehicle certification levels. Several driveability problems were encountered with both cars, and there were fuel economy penalties when compared to current 1975 model vehicles achieving similar levels of pollutant emissions. Aldehyde emissions from the Yamaha lean combustion engine system were lower than present production cars.

44272

APTIC NO. 67471

Environmental Protection Agency, Research Triangle Park, N. C., Emission Control Technology Div.

EMISSIONS FROM A GOULD CATALYST VEHICLE WITH 25,000 ACCUMULATED MILES. Rept. 75-5 RBM, 7p., July 1974. 1 ref.

Emissions tests were performed on a Datsun 610 equipped with a Gould catalyst system which had accumulated 25,000 mi of durability. The catalyst is a three bed type, with the first bed being used for removing oxygen from the exhaust gas before it passes through the second bed which consists of a metallic reduction catalyst. After the reduction catalyst, air is injected to create an oxidizing atmosphere for the oxidation catalyst which is the third bed. The use of the oxygen remover protects the nitrogen oxides catalyst from oxygen spikes. Emissions from the Gould catalyst-equipped car were not at the levels required by the original 1976 standards due to high hydrocarbon levels (.61 g/km). Nitrogen oxide emissions were

.26 g/km as compared with the .25 g/km 1976 standard, and carbon monoxide levels were 1.81 g/km as compared with the 2.1 g/km 1976 standard. Fuel economy of the test car was about 13% better than a comparable vehicle tested by the Environmental Protection Agency.

44273

APTIC NO. 67520

Environmental Protection Agency, Research Triangle Park, N. C., Technology Assessment and Evaluation Branch

EMISSION RESULTS FROM A PROTOTYPE AUDI FOX. Rept. 75-4 DWP, 7p., Aug. 1974. 1 ref.

The exhaust emissions from a prototype Audi Fox were measured. A low mileage Audi Fox prototype equipped with fuel injection and a three way catalytic reactor system achieved 1977 emission levels, with nitrogen oxide emissions below 1 gpm. In two tests conducted according to the 1975 Federal Test Procedure, hydrocarbon emissions averaged 0.14 gpm, carbon monoxide averaged 0.95 gpm, and NOx averaged 0.88 gpm. Fuel economy was also noted.

44274

APTIC NO. 67530

Environmental Protection Agency, Research Triangle Park, N. C., Technology Assessment and Evaluation Branch

AN EVALUATION OF THE LAMKIN DEVICE. Rept. 75-2 AWK, 5p., July 1974.

The Lamkin device for reducing exhaust emissions and improving fuel economy was evaluated. The device is a modification to the stock carburetor using an unconventional fuel metering system. A series of tests were conducted using the 1975 Federal Test Procedure. The % improvement from 4.4% idle carbon monoxide baseline for the Lamkin device was 19% for hydrocarbons, 50% for CO, minus 19% for nitrogen oxides, and a 2% increase in fuel economy. Reducing the CO idle to .2% produced greater reductions than the Lamkin device.

44275

APTIC NO. 67596

Kawasaki Heavy Industries, Ltd. (Japan)

FLOW SHEET OF EQUIPMENTS TO PREVENT PUBLIC HAZARD - DESULFURIZATION PROCESS NO. III. SULFUROUS ACID, GYPSUM METHOD. (Kogai boshi sochi purosesu furo shiito -datsuryu purosesu sono 3-aryusan, sekko-ho(Kureha-Kawaju-ho)). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(9):62-63, Sept. 1974. 3 refs.

The whole process described consists of an absorption process in which sulfur dioxide gas is absorbed into sodium sulfite, thereby producing sodium hydrogen sulfite, a complex decomposition process in which NaHSO₃ reacts with limestone, thereby producing Na₂SO₃ and calcium sulfite, and an oxidation process in which CaSO₃ is oxidized into gypsum by the air. Most of the sulfur oxides in stack gas are absorbed into Na₂SO₃. The absorption rate is 98% when SO₂ concentration is 1500 ppm in the outlet. Desulfurization rate improves when the amount of exhaust gas is reduced to that not exceeding the design value. This process is available as a closed system since excess water added to each process is evaporated into exhaust gas in the absorbing tower. After absorbing SO₂ gas, the absorbing solution reacts with limestone powder crushed previously, thus precipitating insoluble CaSO₃ which is separated by the separator. Meanwhile NaHSO₃ is converted to Na₂SO₃, which is recycled to the absorbing tower. Calcium sulfite, produced by means of complex decomposition, is oxidized into calcium sulfate by the air. A conversion process is arranged to convert sodium sulfate to NaHSO₃.

44276

APTIC NO. 67626

Gijutsu Dai-ichi Kenkyujo (Inst. for Electricity, Lab. No.1)

NITROGEN OXIDES GAS WET TYPE ABSORPTION EXPERIMENT DEVICE. (NOx shissiki gasu kyushu jikken sochi). Text in Japanese. Denkenho (Rep. Inst. Electr.), no. 31-24-25, June 1974.

CONTROL METHODS

44283

An experimental wet-type NO_x absorption device is described in this paper. Desulfurization and denitration are effected simultaneously in this setup. The device is made up of atmospheric pressure absorption equipment and high pressure absorption equipment. The former eliminates NO_x and SO₂ by intimate contact with absorption liquid in a scrubber. The latter eliminates hydrogen sulfide absorption in liquid in the scrubber. The absorption liquid is regenerated by expelling the H₂S under reduced pressure. Dimensions of the equipment, the amounts of materials used, and experimental topics (without experimental details) are listed.

44277

APTIC NO. 67627

Gijutsu Dai-ichi Kenkyujo (Inst. for Electricity, Lab. No. 1)

EXPERIMENTAL DEVICE FOR METHANOL COMBUSTION. (*Metanoru nensho jikken setsubi*). Text in Japanese. *Denkenho (Rep. Inst. Electr.)*, no. 31:22-23, June 1974.

Methanol gives off less heat than natural gas or heavy oil, but is a potential fuel source for steam-power plants because it does not give rise to atmospheric pollutants in the combustion process. An experimental setup for methanol combustion studies is described in this article. A flow-sheet diagram is included. Topics to be investigated are listed, but no experimental details are included.

44278

APTIC NO. 67684

THE TREND IN THE POLLUTION CONTROL INDUSTRY. (*Kogai taisaku sangyo no ugoki*). Text in Japanese. *Kogai to Taisaku (J. Pollution Control)*, 10(9):124-127, Sept. 1974.

New pollution control devices and equipments placed on the market are introduced with the product description, characteristics, specifications, and instructions. The list of products includes a high efficiency Ge(Li) gamma ray detector by Horiba Seisakusho, a dry denitration device for exhaust gas by Nippon Kihatsuyu, a denitration system for package boiler by Kawasaki Zyukogyo, a H₂ pipe (polyethylene pipe) for industrial plumbing by Mitsubishi Zyushi, a simple oil detector by Daito Keiki and Nittetsu Kagaku, a sound level meter by Nippon Kagaku Kogyo, a treatment plant for sewage water by Mitsubishi Kakoki, a super-large desulfurization pump for exhaust gas by Rasa Shoji, and an electrolytic treatment system for water-soluble waste oil by Mitsubishi Zyuko.

44279

APTIC NO. 67817

Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab.

SEMINAR ON ELECTROSTATICS AND FINE PARTICLES - SEPTEMBER 1973. Program Element IABO12, ROAP No. 21ADL-034, Rept. EPA-650/2-74-081, 131p, Aug. 1974.

NTIS: PB 236676/AS

Papers are presented from a seminar on the application of electrostatics to fine particle control. Topics covered in the seminar include: the investigation of systems of charged particles and electric fields for the removal of submicron particulates, the application of charged droplet scrubbing to fine particle control, wet electrostatic collection of fine particles, electrostatic capture of particles in fiber beds, electrostatic precipitator performance, the dust layer and precipitator efficiency, the fractional efficiency of electrostatic precipitators, electric arc generation of metal aerosols in quantity, and new concepts and novel devices for fine particulate control. The last topic is covered in an open pan discussion.

1973

44280

APTIC NO. 67482

Adams, Richard L.

SHAKER TYPE BAGHOUSES. Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 49-53. (Oct. 14-16.)

The technology involved in the application of shaker type baghouses is summarized. Various types of mechanical shakers are examined. The advantages of shaker type baghouses are described in comparison with other types of baghouse equipment, and costs are cited. (Author abstract modified)

44281

APTIC NO. 64266

Barthel, Y., S. Frankowiak, P. Renault, and J. Salvat

THE IFP GAS CLEANING PROCESS FOR TREATING CLAUS TAIL GAS. Institution of Chemical Engineers, London (England), Northwestern Branch and Salford Univ. (England), Proc. Int. Conf. Control Gaseous Sulphur Compd. Emiss., Salford, England, 1973, 17p. (April 10-12.)

The IFP (Institut Francais du Pétrole) process for sulfur recovery from Claus tail gas is described. It is characterized by low plant investment due to lack of corrosion and use of carbon steel throughout, high catalyst activity, and good chemical and thermal stability of both solvent and catalyst. Polyethylene glycol has outstanding stability, as it has been used for more than 1 yr under industrial operation without any treatment; minimum volatilization losses of solvent due to low vapor pressure; lack of foam formation; ease of product separation due to large difference in density between PEG and sulfur; high sulfur purity as the solvent has low solubility in sulfur; ready commercial availability; and low cost of both solvent and catalyst. The process is an important step towards sulfur dioxide pollution abatement, reducing the important costs of the add-on complete SO₂ removal process.

44282

APTIC NO. 64270

Baum, J. Peter

ELECTRIC MELTING FURNACE FLUE GAS REMOVAL. (*Verfahren zur Erfassung der beim Schrottschmelzen und Stahlabstechen von Elektroöfen entstehenden Rauchgase*). Text in German. (Verfahrenstechnik Dr. Ing. Kurt Baum, Essen (Germany)) W. Ger. Pat. Appl. 2,135,839. 5p., Jan. 25, 1973. (3 claims.)

Fumes are trapped from an electric arc furnace when charging scrap and tapping steel by enabling the main dust removal system to be connected selectively to an auxiliary removal system. The fumes are sucked out during charging via a hood consisting of a closed charging basket set sealingly on the furnace, and via a lateral connection connected by a slide flange to the main removal system's suction duct, reducing the pressure within the basket/hood and the furnace interior, so that suddenly arising fumes cannot escape outward. During tapping, the fumes are directly trapped by a hood fitted to the ladle and are sucked away. The steel is poured through an upper slot in the hood into the ladle; the slot's dimensions are such that the outside air is sucked through it at 5-10 m/sec, which is faster than the speed at which the fumes rise.

44283

APTIC NO. 63814

Beam, Jimmie V.

DEVICE FOR CLEANING EXHAUST PRODUCTS. (Assignee not given.) U. S. Pat. 3,775,948. 8p. Dec. 4, 1973. 17 refs. (Appl. Jan. 18, 1972, 16 claims.)

An apparatus for thoroughly cleaning the exhaust products of industrial processes includes a baffled, multi-level spray chamber, a heat exchanger, and a spirally baffled, multi-compartmented separator. A gaseous exhaust medium, containing

entrapped particles as well as condensable vapors, is wetted as it flows downwardly through the spray chamber and deposits moisture entrained contaminant particles on the baffles. The gas is then reduced in temperature, if above its vaporization point, in the heat exchanger with attendant condensation of vapors and further particle deposition. Finally, the gas is vectored upwardly in a spiralling counterclockwise flow within the separator whereby its heavier constituents are collected in the outer compartments of the separator and its lighter constituents in the inner compartments thereof. This apparatus is equally well suited to remove solid or vapor contaminants, and equally capable of accepting heated or unheated exhaust media. (Author abstract modified)

44284

APTIC NO. 64262

Beranek, Jaroslav

SULFUR REMOVAL DURING FLUIDIZED BED COMBUSTION. Institution of Chemical Engineers, London (England), Northwestern Branch and Salford Univ. (England), Proc. Int. Conf. Control Gaseous Sulphur Compd. Emiss., Salford, England, 1973, 19p. 8 refs. (April 10-12.)

A new method for heat removal from the fluidized bed combustor has been developed making it possible to maintain a constant temperature of fluidized bed not only in the combustion process of various types of coal, but also at various feeding rates of fuel into the bed. The method consists of locating the heat exchanger in the lower part of the fluidized bed, and in supplying air needed in the combustion of fuel in the fluidized bed partly underneath the heat exchanger and partly on top of it. In changing the ratio of airflow delivered under the exchanger and above it, the amount of heat which is being transferred from the fluidized bed by means of a liquid flowing through the heat exchanger can be changed over a wide range. The sulfur removal efficiency from the flue gas has been measured in the combustion of lignite with a sulfur content ranging from 2.3 to 8.5%, ash content of from 17.8 to 30.9%, and caloric value in a range of 3350 to 4500 kcal/kg. Limestone from Stramberk quarry, containing 53% calcium oxide was employed for sulfur removal from flue gas. Particles of a size from 0.1 to 1.0 mm were used in measurements. The addition of 2.25 times the stoichiometric amount of limestone to the feed led to the retention of more than 90% of the sulfur. The effect of the particle size has been compared at a sulfur removal efficiency from flue gas of 64%. In comparison with the employment of limestone of a size from 0.09 to 0.2 mm the limestone consumption was nearly 1/2 of that with the limestone of a size 0.1 to 1 mm. (Author abstract)

44285

APTIC NO. 67405

Bergmann, Lutz

FABRIC FILTRATION - TODAY AND TOMORROW. Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 85-90. 4 refs. (Oct. 14-16.)

Fabric filtration as an effective and efficient means for controlling particulate emissions has been recognized and is specified, not only by the growth in the fabric filter market, but also by the prediction that fabric collectors will be the first in sales by 1976. Surface modifications and the inclusion of superfine fibers have made it possible to provide needled felts with greatly improved properties for high air conditioner collector applications. A new needled felt has been developed that combines inorganic materials and promises to offer really high temperature (700+ F) properties. Tables are presented showing the pollution control equipment in the U. S. from 1963 to 1972, the market share of different control equipment from 1969 to 1972, and the market forecast for particulate control devices from 1969 to 1976. (Author abstract modified)

44286

APTIC NO. 67398

Billings, Charles E.

FABRIC FILTRATION THEORY IN DESIGN AND OPERATION. Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 21-25. (Oct. 14-16.)

Fabric filtration theory and fabric filter system models are reviewed. Five mechanisms are involved in filtration: inertial deposition, diffusion, direct interception, gravitational sedimentation, and electrostatic separation. The determination of performance includes specification of collection efficiency, pressure drop, overall cost, and component life in terms of dust, gas, and fabric parameters. Various engine design variables are listed.

44287

APTIC NO. 67407

Budrow, Winston F.

FILTRATION FABRICS ABILITY TO PERFORM. Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 98-105. (Oct. 14-16.)

The requirements for the proper performance of filtration fabrics as applied to filter fabric baghouse dust collectors for industrial particulates are discussed. The three primary functions of a filter fabric are filterability, cleanability, and durability. These functions are discussed to provide data for proper filtration fabric selection. (Author abstract modified)

44288

APTIC NO. 67411

Clark, David G.

FACTORS INFLUENCING THE USE OF FABRIC FILTERS IN THE CEMENT INDUSTRY. Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 140-145. 16 refs. (Oct. 14-16.)

Factors such as dewpoint, high temperature, abrasion, fine particulate size, maintenance safety, and cost must be considered in the application of fabric filters to the control of emissions from the cement manufacturing process. These factors are reviewed, and where these factors play a key role in the successful operation of baghouses is discussed. (Author abstract modified)

44289

APTIC NO. 64261

Collins, A. C. and J. Bettelheim

DRY LIMESTONE INJECTION AS A MEANS OF LIMITING THE EMISSION OF SULPHUR DIOXIDE IN FLUE GASES. Institution of Chemical Engineers, London (England), Northwestern Branch and Salford Univ. (England), Proc. Int. Conf. Control Gaseous Sulphur Compd. Emiss., Salford, England, 1973, 34p. 30 refs. (April 10-12.)

The technical features of the dry limestone injection system are discussed and first order estimates of the cost of such a process are examined. The process was chosen for study because of the wealth of technical data available, the relative simplicity of the on site process, and the general availability of the raw material. The costs derived indicate that on sites where it might prove possible to implement, it would not cost less than \$18.50/kW for capital installation for 50% reduction of the sulfur dioxide emission. Consideration of a number of existing 2000 MW sites showed that it would be extremely difficult to implement, and impossible on some sites. The costs are contrasted with estimates made for U.S. conditions by TVA. (Author abstract)

44290

APTIC NO. 67408

Frederick, Edward R.

RESEARCH NEEDS (FABRIC FILTRATION). *Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 106-111. 1 ref. (Oct. 14-16.)*

Future research needs regarding fabric filters and filter fabrics are outlined. If fabric filters are to attain their potential for particulate control, a major effort will have to be made to find answers to the problems of baghouses. Comprehensive research programs will be needed to eliminate the mystery of fabric specification. Demand for temperature resistant fabric will lead to research in polymers, and requirements for better stability and chemical resistance will lead to research in other fabrics. The relationship between the fiber or fabric and particulates, the role of electrical charge on fabrics and particulates, the charge characteristics of fabrics, and the effects of electrical charges on filter performance will also be studied. (Author abstract modified)

44291

APTIC NO. 64356

Friedling, Gerard and Marcel Chuard

METHOD OF AND APPARATUS FOR CLEANING GASES. *U. S. Pat. 3,778,979. 6p., Dec. 18, 1973. 12 refs. (Appl. March 30, 1971, 3 claims.)*

A method is described for cleaning gas contaminated by dust. It uses an apparatus comprising a nozzle defined by a liquid surface and the surface of a wall and through which the gas is forced so that some of it takes up liquid; a channel existing downstream from the nozzle to a chamber formed above the wall which provides turbulent zone in which the gas becomes wetted throughout; and an opening formed in the wall to communicate the chamber with the upper part of the nozzle whereby wetted gas is returned from the chamber to the upper part of the nozzle to wet the gas which passes through the nozzle without contacting the surface of the liquid. This invention is less bulky and uses less power than previous dust cleaning apparatuses. (Author abstract modified)

44292

APTIC NO. 67415

Friedrich, Henry E.

SESSION REVIEW AND COMMENTS RE: FABRIC FILTRATION. *Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 158-162. (Oct. 14-16.)*

Conference papers on fabric filtration are discussed. The papers stress the need to know the emission problem before selecting the control device. The preferred type of collector must also be determined once a baghouse system is accepted. Considerable information is available on particulate control, and government and vendor data should be consulted. Design factors such as pressure drop, efficiency, cost, and life are critically important. Unfortunately, there is no simple formula for determining the preferred air-to-cloth ratio. Many factors influence this number, including the properties of the particulate and fabric, the cleaning procedure, and a variety of system conditions. Nevertheless, technology in fabric filtration has been developing rapidly, and reasonably accurate predictions of performance and operational characteristics of the various collector types may be made. When serious questions arise about filter system design because the needed background data is sparse or nonexistent, performance tests should be specified. (Author abstract modified)

44293

APTIC NO. 64263

Furkert, H.

THE DRY CHEMIEBAU (REINLUFT) PROCESS. *Institution of Chemical Engineers, London (England),*

Northwestern Branch and Salford Univ. (England), Proc. Int. Conf. Control Gaseous Sulphur Compd. Emiss., Salford, England, 1973, 10p. (April 10-12.)

The Reinluft Process is a dry adsorption process for the removal of oxides of sulfur and other harmful substances from flue gases. It uses carbonaceous adsorbents which are thermally regenerated. The process has been developed in the laboratory and in pilot plants from 1957 onwards, and has undergone successful industrial trials for the treatment of power station stack gases. The process is primarily suitable for the desulfurization of flue gases from oil and coal fired power stations. The products are sulfuric acid, Oleum, stabilized sulfur trioxide or liquefied sulfur dioxide. No useless products or harmful effluents are produced by the process. (Author abstract)

44294

APTIC NO. 64170

Gaut, Norman E., Lee W. Gladden, and Elliot Newman

DYNAMIC EMISSION CONTROLS: A COST EFFECTIVE STRATEGY FOR AIR QUALITY CONTROL. *Preprint, Air Pollution Control Assoc. Pittsburgh, Pa., 22p., 1973. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Seattle, Wash. Nov. 28-30, 1973.)*

The developing fuel crisis and lagging development of technical and economic means for producing clean fuels or removing sulfur from stack gases has caused pressure for clean air control systems which are immediately available, technically feasible, and economical to install and operate. Dynamic emission control systems such as fuel switching, load switching, and process curtailment meet these criteria and are the most cost-effective control strategies available. The merits of these systems are discussed, and their costs and benefits are compared with constant emission control systems. A specific example of a dynamic control system operating in Boston is presented in detail. Its sensors, station facilities, telecommunications system, telemetry, computers meteorological data acquisition equipment, data analysis software, two-dimensional graphic displays, and air quality prediction software are discussed. The real-time air monitoring, analysis, and prediction that comprise the AIRMAP (Air Monitoring Analysis and Prediction) concept offer a viable alternative to across-the-board reductions in sulfur content of fuels or other forms of constant emission controls. It provides information far enough in advance to take positive action and to reduce the impact of large point sources before the onset of a period of poor dispersion conditions. Because there are normally only a small number of poor dispersion days in a year, the AIRMAP service accomplishes improved air quality at a cost typically far lower than a straight, across-the-board reduction of emissions through constant controls. (Author abstract modified)

44295

APTIC NO. 67514

Gifford, D. C.

WILL COUNTY UNIT 1 LIMESTONE WET SCRUBBER DESCRIPTION AND OPERATING EXPERIENCE.

Preprint, Commonwealth Edison Co., Chicago, Ill., 50p., Nov. 30, 1973.

The reasons for installation of a limestone wet scrubber, the technical aspects of the Babcock and Wilcox furnished wet scrubber, the estimated equipment cost and operating expenses, operating experience, and construction problems, are presented. The Babcock and Wilcox designed process is guaranteed to remove 98% of the fly ash and 76% of the sulfur dioxide, but is expected to remove 98% and 83% respectively. The wet scrubber system is divided into three parts: the limestone milling system, the wet scrubber and absorber, the sludge disposal treatment and removal system. It is made up of two identical systems each taking half the boiler flue gas. Each system consists of two recirculation tanks, slurry recirculation pumps, a venturi fly ash scrubber, a sump, a sulfur dioxide absorber, flue gas reheater, and ID booster fan.

44296

APTIC NO. 67410

Godsey, E. S.

APPLICATION OF FABRIC FILTERS TO LEAD AND ZINC SMELTERS. Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 122-139. (Oct. 14-16.)

A brief description is given of baghouses designed and built to ASARCO (American Smelting and Refining Company) specifications for various lead and zinc smelters. Included are examples of experience with bag cleaning systems and shut-off damper design and operation. Tests performed on bag fabrics, control of inflammable dusts, dust loading into baghouses, and a description of a continuous automatic dust sampler are some of the data given on baghouse operation. A method for selecting the best bag fabric to a specific operation and examples of experience with several synthetic fabrics are also included. (Author abstract modified)

44297

APTIC NO. 67412

Guilford, R. L.

FABRIC FILTERS IN THE ALUMINUM INDUSTRY.

Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 146-149. (Oct. 14-16.)

The aluminum industry is among the largest users of fabric collectors for controlling pollutant emissions. By far the highest volume application is on potline fume for capturing alumina and fluoride particulates from smelting cells. Other filter applications include those for collecting carbon dust, nuisance dusts, and oil mist. Favorable fabric bag filter performance at start-up and during extended service depends upon the attention given the system in design, installation, maintenance, and operation. Less than optimum care in any phase of the process results in less than effective overall performance and excessive cost. (Author abstract modified)

44298

APTIC NO. 67480

Heller, Francis

BAG-HOUSE DUST COLLECTORS - PULSE JET CLEANING. Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 38-41. (Oct. 14-16.)

A definition of pulse jet cleaning for baghouse filters is given, along with a description of the technique. Some of the advantages and disadvantages of pulse jet cleaning are enumerated, and a few applications are discussed. In pulse jet cleaning, a short, sharp blast of compressed air is directed back into the opening of the bag, in direct and sharp counterflow to the cleaned air. Since in most cases the bags are suspended vertically and the cleaned air is moving upward inside the bag, the sharp blast is directed downwards into the bag. The short pulse is made with high pressure air or gas. (Author abstract modified)

44299

APTIC NO. 64265

Highley, J.

REDUCTION IN SULPHUR DIOXIDE EMISSION BY FLUIDIZED BED COMBUSTION. Institution of Chemical Engineers, London (England), Northwestern Branch and Salford Univ. (England), Proc. Int. Conf. Control Gaseous Sulphur Compd. Emiss., Salford, England, 1973, 23p. 3 refs. (April 10-12.)

Experimental work to obtain data on the efficiency of sulfur retention over a wide range of fluidized bed combustion operating conditions and to study the mechanisms involved is

described. The main finding is that it is technically feasible to reduce the sulfur dioxide emission from coal-fired fluidized bed combustors to the levels required by existing and likely future legislation by injecting into the flue gas lime in the form of limestone or dolomite. The effect of operating parameters on the efficiency of the sulfur dioxide emission has been determined, and it is now possible to make preliminary estimates of additive requirements for boiler designs. Under optimum conditions it is possible to retain 95% of the sulfur by the addition of about 1.5% theoretical requirement of stone. This would allow a reduction of 100 ppm of SO₂ in flue gas to be achieved even when using a coal containing 3% sulfur. (Author abstract modified)

44300

APPROX

Jones, Allen H.

REVERSE FLOW HIGH TEMPERATURE FILTERS.

Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 42-45. 1 ref. (Oct. 14-16.)

The state-of-the-art of reverse flow high temperature filters for baghouses for particulate removal from gas streams in industrial processes is described. Some of the advantages and disadvantages of various types of equipment are discussed. In the application problems when dealing with extremely high temperature gas streams are reviewed, including one due to high temperature, insulation, and condensation. Two basic types of reverse flow units are the present state of the art. (Author abstract modified)

44301

APPROX

Karby, R. C.

DIRECT REDUCTION OF IRON AND NICKEL SULFIDES BY CALCIUM OXIDE AND CARBON MONOXIDE, WITH SUBSEQUENT RECOVERY OF ELEMENTAL SULPHUR. Dept. of Energy, Mines and Resources, Ottawa (Ontario), Extraction Institute, Mines Branch Investigation Rept. 73-67, 51p., 1973, 31 refs.

A process is proposed for the direct reduction of iron and nickel sulfides, with the subsequent recovery of nickel and iron powder and elemental sulfur. The direct reduction step takes place at 830°C in the presence of calcium oxide and carbon monoxide. After separating the nickel and iron sulfides from the reaction product, either magnetically or by the use of a process, the resulting calcium sulfide is calcined and recycled to the reduction roaster. The hydrogen sulfide is converted to elemental sulfur in a Claus reactor. The process has the advantage that nickel and iron powder are recovered directly and that sulfur is recovered in the form of elemental sulfur rather than being released as gaseous sulfur. (Author abstract)

44302

APPROX

Klimann, Dieter

PROCESS ENGINEERING METHODS FOR THE REDUCTION OF SULFUR DIOXIDE EMISSIONS FROM THE COMBUSTION OF FUEL OILS. (German). VDI-Verlag, Düsseldorf, 1977, 120p., 12 refs. Zusammenfassung zur Entwicklung von Verfahren zur Reduktion der Schwefel- und Stickstoffemissionen aus der Verbrennung von Heizöl. (German). Umwelt Abw. (4):61-74, 1977, (German). Congress Umwelt 72, Stuttgart, Germany, Sept. 1977, 1977.)

According to a study by the Mines Branch Institute, approximately 30% of the atmospheric sulfur dioxide is from human activities; according to the environmental report of the Swedish government, however, only 12 to 15% in the northern hemisphere this percentage might be as high as 30% to about 35%. This indicates that globally the situation is not yet dangerous. During the decade 1960 to 1970 consumption in the Federal Republic of Germany of the total sulfur dioxide emission only 10%. The present situation of coal by fuel oil and the decreasing sulfur

tion of the fuel oils marketed in the Federal Republic of Germany account for that. It is anticipated, however, that the amount of low-sulfur fuel oil will not meet the demands of the second half of the 1970 decade. To combat emissions and immission of the oxides of sulfur other low-sulfur fuels, power generating methods, or secondary measures will have to be taken. Secondary measures include the distribution of the emissions via high stacks, desulfurization of flue gases (which is still in the development stage), desulfurization of the fuel oil during preparation for combustion (fluidized bed desulfurization) and finally the desulfurization of fuel oils. All fuel oil desulfurization methods are based on the principle of liberating the sulfur atoms from their molecular binding and on converting them to gaseous hydrogen sulfide which can be easily separated from the liquid products. Through combustion with equivalent air quantities by the Claus process, elemental sulfur is obtained. For desulfurization, high pressures, high temperatures, a sufficient hydrogen partial pressure, and catalysts are required. The desulfurization of atmospheric and vacuum distillates and of the distillation residues is briefly reviewed. For a desulfurization plant with an annual capacity of 2 million tons/yr investments are expected to cost at least \$7/ton/yr for moderate distillate desulfurization. The operating costs depend on the hydrogen consumption and capital cost and are estimated to come to \$700/ton removed sulfur.

44363

APTIC NO. 67512

Koch, Hans

INVESTIGATIONS AND MEASURES FOR THE REDUCTION OF GAS TURBINE EMISSIONS. *American Society of Mechanical Engineers, New York, Int. Congr. Combust. Engines, 10th, Proc., Washington, D. C., 1973, p. 1247-1265. 4 refs. (April 5-9.)*

Two types of combustors are described for which nitrogen oxide and smoke characteristics are presented in terms of lbs nitrogen dioxide/10 to the 6th power and Smoke Spot Number versus % load. The tests were carried out on full scale experimental combustors burning Distillate No. 2-GT. It could be demonstrated that with a full scale experimental combustor of type B having 90,000 KW heat loading and fuel injection from a single atomizer, low NOx values can be reached. At full load, 0.5 lb NO2/10 to the sixth power was measured. The NOx-characteristics (lb NO2/10 to the sixth power) is to a large extent independent of the load and, in fact, shows a falling tendency in places. The formulation of general criteria for the design is subject to further research. The combustor type B2 shows a somewhat better result than type A. A disadvantage with combustor A is the load dependent NOx-characteristic. A disadvantage of combustor B2 is the higher smoke tendency which also needs further research. (Author summary)

44384

APTIC NO. 67738

Malysheva, Y. S., M. G. Gandman, V. T. Kondrat ev, and V. M. Kondrat ev

STUDY OF DEGREE OF TECHNOLOGICAL AIR PURIFICATION DURING BIOSYNTHESIS OF ANTIBIOTICS. (*Izucheniye stepeni ochistki tekhnologicheskogo vozdukh pri biosinteze antibiotikov*). Text in Russian. *Khim.-Farm. Zh. Moscow, 7(11):49-52, 1973. 3 refs.*

A method for the purification and sterilization of technological air for the commercial biosynthesis of antibiotics and its efficiency are described. The air is first purified by means of viscous oil filters after which it is compressed to 3.5-4 atm to reach 200 C in a compressor. The air is then cooled to 65-75 C and is subjected to final filtration in group filters with basalt fiber packing. The purification process has an efficiency of 99.8% for aerosol particles larger than 0.5 micron. The viscous filters retain up to 70% of the 50 to 60 different microorganisms present in the raw air. The air sampled after the group filters contained microorganisms only rarely. The control of microorganisms by means of the antibiotics actually produced, especially by novobiocin and tetracyclin, was highly efficient.

44385

APTIC NO. 64364

Moss, G., J. W. T. Craig, J. H. Taylor, and D. E. Tisdall

THE DESULPHURISING FLUIDISED BED GASIFIER. *Institution of Chemical Engineers, London (England), Northwestern Branch and Salford Univ. (England), Proc. Int. Conf. Control Gaseous Sulphur Compd. Emiss., Salford, England, 1973. 26p. (April 10-12.)*

An account is given of the development of a fluidized bed process for the desulfurization and gasification of heavy fuel oil. This work provides data required for the design of a scaled up gasifier which it is intended will be fitted to a 100 MW power generation boiler in the United States. Aside from controlling gaseous sulfur compound emissions, the gasifier offers the benefit of retaining virtually all of the vanadium in the fuel. Staged combustion results in a substantial fall in nitrogen oxide emissions. The gasifier consists of two fluidized bed reactors situated side by side. The reactivity of the bed material within the gasifier is maintained at a high level by continuously changing it with bed material from the regenerator. Despite the continuous regeneration there is a gradual decline in the reactivity of the lime which can be countered by a steady replacement of the bed material with uncalcined stone. Preliminary cost estimates indicate the unit to be fully competitive with alternative processes and considerably cheaper than the wet ashing. The process also lends itself to pressurized operation and may be used to fire gas turbines with heavy fuel oil.

44386

APTIC NO. 67808

Nobe, Ken and George L. Bauerle

CATALYSTS FOR AUTOMOTIVE POLLUTION CONTROL DEVICES (FINAL REPORT). *California Univ., Los Angeles, School of Engineering and Applied Science, California Air Resources Board Proj. ARB-2-009-1, ARB-R-PCA-189-73-02, UCLA-ENG-7371, 169p., Sept. 1973. 27 refs.*

NTIS: PB 229-351

Over 100 catalysts were investigated for use in the control of nitrogen oxides, carbon monoxide, and hydrocarbon emissions from motor vehicle engines. Catalysts were tested in the laboratory for reactions between nitric oxide and CO, NO and hydrogen, CO and oxygen, and for ammonia. Concentrations of NO, CO, carbon dioxide, nitrogen dioxide, NH3, hydrocarbons, nitrous oxide, and O2 were monitored. Catalysts tested included rare earth and transition metal oxides, noble metals, Monel, tungsten bronzes, nickel, and stainless steel. The best catalysts were exposed to exhaust gases from a dynamometer-mounted engine in a small reactor under simulated oxidizing or reducing conditions. Several catalysts were tested in a prototype two-stage converter. A strontium yttrium ruthenium oxide in the first stage reduced NO emissions 90%. Ruthenium and ruthenium oxides selectively reduced NO to N2 rather than to NH3. A nickel/platinum catalyst in the second stage totally removed CO for at least 150 hr. (Author abstract modified)

44387

APTIC NO. 67413

Proctor, W. Con

FABRIC FILTERS AND THE HOT MIX ASPHALT PLANT. *Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. Equip. Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 150-154. (Oct. 14-16.)*

The state-of-the-art of fabric filters (bag filters) use in hot mix asphalt plants is discussed. The efficiency of use, costs, and problems are reviewed. Sources of particulates in the hot mix asphalt industry include the rotary drier, the hot aggregate elevator, vibrating screen, storage bins, weigh hopper, and mixer. Particulates in the range from 0.3 to 7.4 micron are the main problem in the industry. (Author abstract modified)

44306

APTIC NO. 65954

Reid, George W. and Kenneth C. Govaerts

AN ECOLOGICAL APPROACH TO WASTE DISPOSAL. Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 3rd Annu. Meet., Louisville, Ky., 1973, p. 59-68. (March 5-6.)

Waste disposal is discussed from an ecology standpoint. Basic to ecology is the notion of the balance of nature, and the pattern which nature exhibits is that of self-recycling energy system. Pollution has been defined as a resource out of place. Although problems of environmental pollution are generally attributed to industrial usage, domestic waste residuals are increasing each year. Only a fraction of these wastes are recycled, and traditional waste handling practice is largely a one-day system. The need exists to direct a design to a more integrated and ecological approach which treats agriculture, food processing, and waste disposal as a unitary system.

44309

APTIC NO. 67404

Rullman, Donald H.

SYSTEM DESIGN CONSIDERATIONS FOR PROPER APPLICATION OF FABRIC COLLECTORS. Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 60-84. (Oct. 14-16.)

The fundamental principles of fabric filtration are reviewed. The characteristics of process gas and particulate contaminants are listed and reviewed. Several baghouse fabric collector applications are described, including electric arc furnaces, cupolas, and cement clinker coolers. Factors important to the system design include evaluation of the fundamental emission problems, evaluation of methods of hooding, gas treatment necessary, and possible interference with process and material reclaim. System design parameters which must be investigated are listed. In order to intelligently select from the multiple collector types available, an application engineer must be familiar with the process on which the collector is to be applied, the characteristics of the process off gas volume, the characteristics of the particulates emitted, and the filtering and operating characteristics of several fabric collectors which could logically be applied. The three basic mechanisms of fabric filtration are impaction, direct interception, and diffusion. Characteristics related to high efficiency filtration through fabric and mechanisms related to gas filtration (flocculation and sieving) should also be considered. (Author abstract modified)

44310

APTIC NO. 66030

Schaefer, Helmut

POSSIBILITIES AND LIMITS OF WASTE HEAT UTILIZATION. (Möglichkeiten und Grenzen der Abwärmeverwertung). Text in German. Umwelt Aktuell, (6):69-75, 1973. (Presented at the conference held during Environment 72, Stuttgart, Germany, June 30-July 9, 1972.)

General problems of the possibilities and limits of waste heat utilization in power plants and other installations are discussed. The high efficiency of modern combustion equipment in power plants is partly due to the utilization of waste heat, e.g., for preheating the combustion air. While waste heat utilization in general is technically possible, it is limited by economic aspects in many cases, especially so because environmental considerations are ignored. Another hindrance in waste heat utilization is the lack and heterogeneous distribution of the demand and supply, which makes even heat storage for subsequent use unattractive in many cases.

44311

APTIC NO. 67403

Schwab, Martin J.

REVERSE JET TYPE FABRIC FILTER. Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section

and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 54-59. (Oct. 14-16.)

The theory of operation, construction features, installation details, and illustrative case histories are presented for a reverse jet type fabric filter used in baghouses. The dust-laden air enters near the top of the unit. Heavier particles fall directly into the hopper and finer particles are retained on the bags. As particles accumulate, the air flow resistance increases. At a pre-determined resistance level, a differential pressure-actuated switch activates the cleaning mechanism. The blow-rings move up and down, slightly indenting the fabric tubes. The high velocity air jet, from the slotted blow-ring, penetrates the fabric. The flexing and indenting dislodges the dust which is then carried into the hopper by the downward flow of air. The cleaning action continues until a pre-determined lower resistance is reached. The unit permits continuous operation at full or partial loads.

44312

APTIC NO. 67490

Sebastian, F. P., G. F. Kroneberger, L. A. Lombana, and J. M. Napoleon

LATEST DEVELOPMENTS ON POLYCHLORINATED BIPHENYLS DECOMPOSITION IN BSP MULTIPLE HEARTH FURNACES. AIChE Workshop, vol. 5:67-74, 1973 (?). 6 refs.

Developments in the decomposition of polychlorinated biphenyl sludges in multiple hearth furnaces are reported along with laboratory furnace test data. The tests indicate that PCB can be destroyed in multiple hearth furnaces to the degree desired by the Environmental Protection Agency at temperatures less than 1100 F and at retention times of less than 0.2 sec. Smaller afterburners can be used with afterburner temperatures of 1200 F and retention times of 0.5 sec, the suggested combustion equivalent. The lower temperature results in substantial fuel savings and reduction in nitrogen oxide concentrations which accompany high temperatures. The PCB concentration levels presently found in municipal sludges are well below those used in the tests.

44313

APTIC NO. 67406

Smith, Elbridge M.

STATUS OF TC-1 FABRIC FILTER INFORMATION REPORT. Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 91-97. 7 refs. (Oct. 14-16.)

The status of the Technical Council of the Air Pollution Control Association's TC-1 Particulate Committee report on fabric filters is reviewed. The document is entitled the Information Required for the Specification, Purchase and Performance Evaluation of Industrial Baghouses (Fabric Filters). The evolution of the report is described, and various document outlines are presented. (Author abstract modified)

44314

APTIC NO. 65866

Stewart, W. F. and F. J. Edeskuty

LOGISTICS, ECONOMICS, AND SAFETY OF A LIQUID HYDROGEN SYSTEM FOR AUTOMOTIVE TRANSPORTATION. Preprint, American Society of Mechanical Engineers, New York, 11p., 1973. 40 refs. (Presented at the American Society of Mechanical Engineers, Inter-society Conference on Transportation, Denver, Colo., Sept. 23-27, 1973, Paper 73-ICT-78.)

A hydrogen-powered automobile to solve the energy problem and reduce emissions is described. The development of a hydrogen-powered automobile involves the development of a hydrogen-fueled engine, a hydrogen storage system on board the vehicle, and a hydrogen production and distribution system. Several design aspects, cost estimates, and safety considerations are discussed for a liquid hydrogen production and

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distribution system. The amount of liquid hydrogen that must be produced annually to replace the gasoline consumed by automobiles is estimated. This estimate includes boiloff, cool-down and transfer losses from the production plants, transport trailers, service stations, and automobiles. (Author abstract modified)

44315

APTIC NO. 67807

Storment, J. O. and K. J. Springer

ASSESSMENT OF CONTROL TECHNIQUES FOR REDUCING EMISSIONS FROM LOCOMOTIVE ENGINE (FINAL REPORT). Southwest Research Inst., San Antonio, Tex., Dept. of Transportation Contract, Work Unit RR416/R4316, Rept. FRA-ORD, Rept. D-74-21, DOT-TSC-FRA-73-9, 316p., Nov. 1973. 7 refs.

NTIS: PB 229-991

The most effective method of reducing emissions of oxides of nitrogen from a two-cylinder version of an Electro-Motive Division series 567 C locomotive diesel engine was determined. The NOx control techniques studied included: change in fuel injector design, variation in injection timing from the standard setting, inlet air humidification (water induction), reduction of scavenging air volume (air box bleed), and exhaust gas recirculation. The most effective control method was retarded injection timing followed by exhaust gas recirculation, with the recirculated exhaust cooled to 125-150 F. It was necessary to reduce engine power at certain points to maintain smoke opacity to acceptable levels with all of the control techniques. The methods were judged on greatest reduction of NOx with the least adverse effects on other emission constituents and engine operation, and simplicity of installation. (Author abstract modified)

44316

APTIC NO. 67517

Tieman, John W.

AVAILABLE AND PROPOSED DEVICES FOR THE CONTROL OF SULFUR DIOXIDE EMISSIONS FROM COAL BURNING BOILERS. Preprint, Illinois Inst. of Tech., and Bituminous Coal Research, Inc., Monroeville, Pa., 14p., 1973. (Presented at the American Power Conference, Annual Meeting, 35th, May 8, 1973.)

A status report is presented on the various programs being carried out in an attempt to deal with the availability of commercial processes to control sulfur oxide emissions from power plant boilers. The most promising processes are starting to demonstrate their special capabilities for controlling different aspects of the problem. Those processes which are being tested on a scale large enough to be classified as commercially acceptable include: dry additive injection, lime/limestone scrubbing, sodium-base scrubbing, and catalytic oxidation. None of the units, to date, has shown commercial acceptability. Despite this, many utilities are ordering removal systems which have shown the greatest promise. There are serious reservations on performance, especially with regard to availability and reliability. The panel's definition of proven industrial-scale acceptability (i.e., commercialization stature) is satisfactory operation in a 100 megawatt or larger unit for more than one year.

44317

APTIC NO. 65872

Weil, Kurt H.

THE HYDROGEN I.C. ENGINE--ITS ORIGINS AND FUTURE IN THE EMERGING ENERGY-TRANSPORTATION-ENVIRONMENT SYSTEM. Stevens Inst. of Tech., Hoboken, N. J., Rept. 729212, 9p., 1973 (7). 55 refs.

NTIS: N74-18403

The present fuels used in internal combustion engines cause pollution. Lower efficiency cycle automotive engines and catalytic exhaust treatment are technically unsound and waste remaining fuel reserves. Therefore the hydrogen internal combustion engine is being developed. The hydrogen multi-fuel in-

ternal combustion engine is the key component of a comprehensive electricity-hydrogen energy system which would control air pollution and would solve the electric utilities problems of low load factors, transmission, and energy storage. The history, present, and future of such engines are discussed. Air and heat pollution, costs, transportation, storage, and distribution are described. (Author abstract modified)

44318

APTIC NO. 67409

Whitlock, Richard G.

SYSTEM DESIGN FOR TODAY AND TOMORROW. Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 113-121. (Oct. 14-16.)

Installation of a fabric filter collector indicates a desire to comply with air pollution control requirements. The plant operator must also be prepared to adapt his equipment to process changes, increases in production, or code changes. More importantly, he must be prepared and equipped to maintain the equipment at design performance levels at reasonable cost and with minimal interruption to the process. The design considerations are discussed. The type of fabric filter cleaning mechanism and filter arrangement are considered as they relate to maintenance, process adaptability, and overall cost. Fabric selection and air-to-cloth ratio are also discussed. Auxiliary equipment such as fans, motors, air locks, temperature controls, and ductwork are discussed, as their design affects future performance and cost. The importance, real cost, and initial design considerations of maintenance are discussed. Proper inspection procedures are necessary to minimize maintenance costs and obtain peak performance. (Author abstract modified)

44319

APTIC NO. 67479

Yosim, S. J., L. F. Grantham, D. E. McKenzie, and G. C. Stegmann

THE CHEMISTRY OF THE MOLTEN CARBONATE PROCESS FOR SULFUR OXIDES REMOVAL FROM STACK GASES. Advan. Chem. Ser., no. 127:174-182, 1973. 8 refs.

Molten carbonate scrubbing of gas streams for sulfur dioxide removal is reviewed with particular emphasis on the chemical reactions involved in the process. The process utilizes a molten eutectic mixture of lithium, sodium, and potassium carbonates to remove SO₂. The resulting molten solution of alkali metal sulfites, sulfates, and unreacted carbonate is regenerated a two-step process to the alkali carbonate for recycling. Hydrogen sulfide, which is evolved in the regeneration step, is converted to sulfur in a conventional Claus plant. Economic estimates for an 800 MW generating station, operating at a 70% plant factor and burning coal containing 3% sulfur indicate a total capital requirement of about \$24 million or about \$30/KW of generating capacity which is quite competitive with that for any other stack gas treatment process which recovers sulfur in useful form. Estimated annual operating cost for the 800 MW plant is 1.0 mills/KR-hr without any credit being taken for the by-product sulfur produced.

44320

APTIC NO. 67506

THE COUILLET ORE-SINTERING PLANT OF THE HAINAUT-SAMBRE COMPANY. ACEC Rev., no. 2:3-14, 1973.

An ore-sintering plant of the Hainaut-Sambre Company is described, with particular reference to the electrical equipment installed, including two electrostatic precipitators for dust control. The main dust precipitator is responsible for collecting dust from the sintering flue gases, while a secondary dust precipitator handles air coming from various points where the ores or sinters are treated in the course of production. Dust

concentrations at the intakes of the main and secondary precipitators are respectively 5 and 20 g/N cu m, while those at the outlets are 0.15 g/N cu m in each case. The supply voltage can be automatically adjusted to the optimum value by an electronic circuit.

44331

APTIC NO. 67848

EXPERIENCES WITH INDUSTRIAL WASTE INCINERATION AT BASF. (*Esperienze di combustione dei rifiuti industriali alla BASF*). Text in Italian. *Inquinamento Acqua Aria Suolo*, 15(1):23-28, Jan.-Feb. 1973.

Waste incinerator plants built by BASF for the incineration of solid, semisolid, and liquid chemical wastes are described. The solid wastes are crushed, and the liquid wastes are injected into the furnace for incineration at 900-1000 C. The operating temperature of the afterburning chamber is between 1000 and 1200 C. The dust content in the flue gases is reduced to a limit of 50 mg/cu m by means of an electrostatic precipitator. Costs are cited.

44332

APTIC NO. 67722

Parsons (Ralph M.) Co.

THE BEAVON SULFUR REMOVAL PROCESS FOR THE PURIFICATION OF SULFUR PLANT TAIL GAS.

Preprint, Salford Univ. (England), 7p., 1973. (Presented at the Conference on Control of Gaseous Sulfur Compound Emissions, April 10-12, 1973.)

The Beavon sulfur process is described for reducing the sulfur content in stack gas from Claus sulfur plants to well below 250 ppm of sulfur dioxide. The SO₂ and elemental sulfur are catalytically hydrogenated to hydrogen sulfide. The catalyst also reacts water vapor with carbon monoxide to form hydrogen, and reacts water with carbonyl sulfide and carbon disulfide to hydrogen sulfide and carbon dioxide. The hydrogenation approach is highly reliable. Following bench-scale development of the process, a demonstration unit was built and operated on a slipstream of tail gas from a large commercial sulfur plant. After initial testing, the demonstration unit was moved and studied further. In general, the total investment, including royalty, in a Beavon Tail Gas Purification Unit will be somewhat less than that of the parent sulfur plant. An appreciable part of this cost involves the H₂S extraction system, and will vary with the quantity of H₂S to be extracted. In conjunction with a Parsons Sulfur Plant, an efficiency of over 99.9% in the elimination of sulfur compounds from natural and refinery gas is readily obtained.

44333

APTIC NO. 67799

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air and Water Programs

FUEL ECONOMY AND EMISSION CONTROL. In: *Decision of the Administrator of the Environmental Protection Agency Regarding Suspension of the 1975 Auto Emission Standards. Part I. 93rd Congress, 1st Session, Serial 93-H9, p. 414-437, 1973. (Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works United States Senate, April 16, 17, and 18, 1973.)*

GPO

The effect of emission controls on automobiles in terms of fuel penalties is analyzed and placed in perspective with other fuel penalties which currently, or in the future, may exist. Data from over 2000 cars tested by the Environmental Protection Agency, of which 1400 were equipped with emissions controls, indicate that vehicle weight is the single most important vehicle design parameter affecting fuel economy. The average fuel economy loss due to emission control for 1968-1973 vehicles is less than 8% and is approximately equal to the penalty associated with the use of convenience devices such as air conditioning or automatic transmissions. Despite the statements regarding the loss in fuel economy due to meeting the 1975/1976 standards, no significant trend is yet apparent from

the data available to the EPA. The use of engines other than the present spark-ignition, reciprocating engines could have a significant impact on vehicle fuel economy based on test results.

1972

44334

APTIC NO. 67843

Aleta, C. R.

A SURVEY OF METHODS OF CONTROLLING STACK GAS EMISSIONS FROM POWER PLANTS. Cornell Univ., Ithaca, N. Y., Cornell Energy Project, National Science Foundation Contract G1-29403X, Rpt. NSF/RA/N-72-002, 14p., Jan. 1972. 3 refs.

NTIS: PB 227860

A survey of power plants using coal as their major fuel was undertaken to determine the control methods being employed to limit particulate, sulfur oxide, and nitrogen oxide emissions. Almost all respondent companies reported employment of particulate matter control, with the electrostatic precipitator being the major control device. Stack gas cleaning with scrubbers was the major method used by many companies to control sulfur dioxide emissions. Insufficient information was reported on NO_x control, and only a few companies have any research and development programs for NO_x control. Costs of the various control methods are cited.

44335

APTIC NO. 67513

Blakeslee, C. E.

REDUCTION OF NO_x EMISSIONS BY COMBUSTION MODIFICATIONS TO A GAS-FIRED 250-MW TANGENTIAL-FIRED BOILER. Preprint, Combustion Engineering, Inc., Windsor, Conn., *Field Testing and Performance*, 3p., 1972. 3 refs. (Presented at the Conference on Natural Gas Research and Technology, Atlanta, Ga., June 5-7, 1972.)

The effects of water injection and operation without air preheat in a single unit, in addition to overfire air simulation (off-stoichiometric combustion) and variations of operating conditions such as excess air, firing rate, and fuel-air distribution, are presented. Results are given for a series of 35 test conditions established on a gas-fired boiler with tangential firing to study the influence of design and operating variables on NO_x emissions and unit operating performance. Overfire air application is more economical and more effective in controlling NO_x emissions from gas-fired utility steam generators than either water injection or reduction of air preheat. (Author abstract)

44336

APTIC NO. 64113

Gostomczyk, M. A. and J. Kuropka

PARAMETERS OF SO₂ SORPTION IN AN ANION EXCHANGER. (*Parametry sorpcji SO₂ na anionowej*). *Air Conserv. (English translation from Polish of: Ochrona Powietrza)*, 6(6):33-36, 1972. 7 refs.

NTIS: TT 72-54023/6

Tests of sulfur dioxide sorption in an anion exchanger sprinkled with a 10% solution of sodium hydroxide are described. The SO₂ ranged from pure to diluted with air concentrations of .001-.015 kg/cu m. Anion exchangers were suitable for elimination of SO₂ from gases. Tests with a 10% spray solution of NaOH at 10 l/hr and two plates with 0.0015 cu m of anion exchanger placed on each and a constant volume of 50, 150, and 250 l/hr SO₂ gave good sorption efficiency ranging above 99%.

44337

APTIC NO. 63485

Kamazuka, Isezi and Katsuhiko Ohiwa

FUEL INJECTION CONTROL SYSTEM FOR INTERNAL COMBUSTION ENGINES. (*Nippondenso Kabushiki*)

Kaisha, Aichi-den (Japan)) U. S. Pat. 3,683,869. 6p., Aug. 15, 1972. 3 refs. (Appl. Feb. 3, 1970, 6 claims).

A fuel injection control system used for internal combustion engines is described. It is provided with electromagnetic fuel injectors. The control system includes electronic circuits to control the opening period of the injection valves to feed an appropriate amount of fuel to the engines according to peripheral conditions and is characterized in that the system includes a means for stopping the supply of fuel to the cylinders during no-load driving and during braking with the motor to prevent the discharge of harmful exhaust gases. This is an improvement over previous fuel injection control systems which did not have a means to minimize the harmful components in the exhaust gas discharged under these conditions. (Author abstract modified)

44338

APTIC NO. 67747

Liddle, Sidney G.

EMISSIONS FROM HYBRID VEHICLES. Preprint, General Motors, Warren, Mich., Research Labs., p. 235-242, 1972 (?). 9 refs.

A study was made to determine the emissions reduction potential of piston engine-electric hybrid vehicles. Series and parallel hybrids were considered in a 4000-pound vehicle. To facilitate this study, a computer program was written which modeled the vehicle and, using engine test data, computed its emissions and fuel consumption over the 1972 FTP driving cycle, starting with a fully warmed engine. Under certain conditions, emissions may be reduced for a hybrid vehicle, compared to its conventional counterpart, but under other conditions they may be increased. The extent of the reduction or increase experienced with hybrid operation depends on the particular pollutant and the engine operating conditions. Unburned hydrocarbons, for example, are reduced by as much as 76%. Depending on conditions, carbon monoxide and oxides of nitrogen increase up to 23% or decrease up to 40%. Therefore, the hybrid vehicle does not automatically guarantee lower emissions. There is no optimum operating point for low emissions and high fuel economy, as claimed by some. (Author abstract modified)

44329

APTIC NO. 70029

Lindvall, Thomas, Olle Noren, and Lennart Thyselius

ODOR CONTROL MEASURES IN LIQUID MANURE HANDLING. (Luktreducerande atgarder vid flytgodshantering). Text in Swedish. Swedish Inst. of Agricultural Engineering, Uppsala, 52p., Sept. 22, 1972. 15 refs.

Methods for the control of odors from liquid manure were investigated in laboratory and field tests. Odor counteraction was measured by olfactory threshold tests and by comparing the odor intensity with hydrogen sulfide. There was no difference between untreated pig manure and manure treated with Dydor. Treatment with ammonium persulfate lowered the odor level. Various spreading and burial methods were compared using untreated manure, and cattle manure with or without the Licom treatment. The lowest threshold value was with the liquid manure injector (10 superscript 1.5) which was lower than the value given by normal spreading on the surface (10 superscript 3.5). The Licom treated cattle manure had a lower odor than untreated manure. The injector lowered the odor threshold better than any other form of burial. The mean value for the injection was 10 superscript 2.57 compared to 10 superscript 3.76 for surface spreading.

44330

APTIC NO. 63982

Ogasahara, Mitsunobu, Toshimi Takaki, and Kenichi F. Jii

BASIC STUDIES ON THE FORMATION AND REDUCTION OF NO AND CO IN COMBUSTION GASES. (Nenasho gas chu no NO oyobi CO no seisei to sono teigen-ho ni kansuru kinote-ki kenkyu). Text in Japanese. Nippon Jidosha Kenkyujo Kenkyu Sokuhu (Res. Lett. Japan Automob. Inst.), no. 10: 105-124, Sept. 1972. 12 refs.

Experimental and theoretical studies showed that when the ratio of mixing of fuel and air was equal to or less than stoichiometric value, the content of carbon monoxide was much larger than the equilibrium value near the flame front. However, the content rapidly approached the theoretical value in the down stream within about 3 msec. When the fuel was in excess, the CO content was approximately equal to the theoretical value near the flame front. When the mixing ratio was equal to or less than the stoichiometric value, the nitric oxide content was less than the theoretical value. The rate determining step of NO formation was $N + NO \rightleftharpoons N_2 + O$. The rate constant was given. Although the equilibrium concentration and the rate of formation of NO increased with the rise in temperature, the rate of formation was very slow below about 1700 K. The nature of the fuel, namely, the hydrocarbon, little affected the equilibrium and the rate of formation, provided that the temperature was given. The recirculation of exhaust gas and the injection of water into the combustion chamber are effective to reduce the NO content in the exhaust gas. This reducing effect was attributable to the lowering of the combustion temperature. In the case of two-stage combustion, the lower the temperature in the primary combustion, the larger was the reduction of NO concentration.

44331

APTIC NO. 67486

Parikh, Prakash, S. P. Patil, and K. N. Parikh

ULTRA-JET DUST COLLECTOR-NEW EQUIPMENT FOR AIR POLLUTION CONTROL. Chem. Eng. World, 7(11):46-48, Nov. 1972.

The design and application of the Ultra-Jet Dust Collector are described. The Collector is a fabric filter which has a baffled top inlet for dust laden air which eliminates entrainment of collected dust by the entering air. Almost any type of air pollution can be controlled by the Ultra-Jet Filter. It can operate beyond the temperature of 425 F with the use of Nomex fabric. The Ultra-Jet is effective with dust generated in cement, ceramics, coke, wood, flour, flume, plastic, rubber, graphic, salt, talc, and many other industries. The equipment not only gives a perfectly clean discharge into the atmosphere, but also helps to pay for itself by collecting the particles in dust form which can be reclaimed. The application of the collector to shot or sand blasting is described.

44332

APTIC NO. 67903

Shah, I. S.

SO₂ REMOVAL USING CALCIUM BASED ALKALIES PILOT PLANT EXPERIENCE. AIChE Symp. Ser., 68(126):132-138, 1972.

Pilot plant test programs for sulfur dioxide removal using calcium based alkali are discussed. Pilot plants were installed at eight different power generating stations, all of which use coal as the fuel. The limestone quality had significant effect on SO₂ absorption and varied regionally. Smaller particle size and higher stoichiometry increased SO₂ absorption efficiency. The presence of a delay tank increased efficiency or reduced limestone requirements for the same efficiency. With a suitable combination of limestone quality, particle size, reasonable stoichiometry, and delay time, SO₂ removal efficiency as high as 80-85% was obtained. With the use of lime or carbide sludge as the absorbing agent, over 90% efficiency at 130% or less stoichiometric lime requirement can be obtained. Selection of alkali should be made after proper economic evaluation which should include stoichiometric requirement, alkali cost, grinding and preparation costs, disposal cost, and installed equipment costs. Scaling and buildup problems are inherent when using lime or limestone slurry as absorbing liquor. Proper methods of operation and selection of scrubber absorption equipment may help reduce the frequency and extent of these problems. (Author summary modified)

1971

44333

APTIC NO. 67763

Agafonov, A. V. and S. A. Feigin

HYDRODESULPHURIZATION OF PETROLEUM RESIDUES. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulfurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, 15-22, 5-6, 1971. 4 refs. (Nov. 16-20, Paper A.2.)*

The increased demand for use has decreased the supplies of low-sulfur crude oils and increased the use of high-sulfur crude oils. Hydrotreating processes such as hydrodesulfurization have been developed to decrease the S content of fuel oils. Such processes being developed in the USSR are reviewed. Variations of the basic processing of sulfur-bearing fuel oils have been developed including catalytic and thermal cracking followed by hydrofining of distillates, thermocontact cracking of short residuum differing in the amounts of feedstock processed by this method, hydrocracking of fractions above 240°C at 30 atm, and hydrocracking of short residuum in the fluidized catalyst bed at 150 atm. The most economical processes ready for commercial use are those involving hydrofining of heavy and light distillate fractions and thermocontact processes. To achieve deeper refining of fuel oils and to save their reserves, the process of direct hydrogenation of residual feedstocks must be developed. Removal of sulfur from fuel oils increases resources of high quality sulfur and reduces air pollution. Costs and material balances of the various processes are cited.

44334

APTIC NO. 67767

Alpert, S. B., G. Nongbri, W. C. Rovesti, and R. H. Wolk

H-OIL PROCESSING FOR CLEAN AIR. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulfurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 80-95, 5-6, 1971. 10 refs. (Nov. 16-20, Paper A.6.)*

Air pollution regulations have limited the amount of sulfur allowed in heavy fuel oil. This has resulted in the development of the H-Oil process using an ebullated bed and supported catalysts buoyed by upwardly flowing liquids and gas reactants. Three commercial plants are now being operated and one is under construction. Other commercial plants have been built or are under construction using fixed beds. The ebullated bed is basically a liquid fluidized bed of formed catalyst through which gas flows. Advantages and disadvantages of the H-Oil process for desulfurization are described. Classes of residual oils, demetallization by catalysts, and performance of the H-Oil process on Gach Saran atmospheric residuum are discussed.

44335

APTIC NO. 67765

Audibert, F. and P. Leprince

INTEGRATION OF FUEL HYDRODESULPHURIZATION INTO VARIOUS REFINING SCHEMES. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulfurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 61-62, 5-6, 1971. (Nov. 16-20, Paper A.4.)*

Various refining techniques, one of the most important of which is catalytic treatment by hydrogen, can be used to reduce the sulfur content of fuels. The hydrodesulfurization of distillates is widely used in oil refining to eliminate S from gasoline, kerosene, and light and heavy gas oil. It is also used to process heavy products obtained by thermal refining methods. It is highly efficient and is used for light or heavy gas oils with an efficiency of 90% or more. Hydrodesulfurization of residues is more difficult to use because the catalyst may be affected by nickel and vanadium organometallic com-

pounds in the fuel oil. The processed fuel can be used in electric power plants, industry, or households to avoid air pollution. The sulfur content of atmospheric residue can be reduced by about 75% with hydrogen. Vacuum distillation can be used to give a fraction of liquid products that can be hydrodesulfurized by a known method, while the other fraction with much higher S content can be used in electric power stations where stack gas can be desulfurized.

44336

APTIC NO. 64188

Babeser, P.

SULFUR RECOVERY FROM SULFATED AND WET GASES. (*Odzysk siarki z zasiarzonych i wilgotnych gazow*). *Air Conserv. (English translation from Polish of: Ochrona Powietrza), 5(5):29-41, 1971. (Presented at the Polish-French Symposium, Paris, France, Nov. 1969.)*

NTIS: TT 72-54022/5

An effective method of recovering sulfur from waste gases was studied by a firm exploiting natural gas deposits in Lacq. Three existing sulfur recovery methods were adapted to the local conditions. Test results of sulfur dioxide and hydrogen sulfide recovery by means of dry catalysis of alumina deposits are given. The tests were conducted on laboratory, pilot plant, and industrial scales. The other methods reviewed are absorption processes connected with thermal treatment, wet absorption processes, recovery of sulfur compounds through formation of sulfuric acid, and cyclic processes with a solid absorber.

44337

APTIC NO. 67519

Barbieri, A.

TECHNIQUES FOR THE ABATEMENT OF AIR POLLUTION GENERATED BY PETROLEUM PRODUCTS. (*Tecniche di abbattimento degli inquinanti atmosferici da prodotti petroliferi*). Text in Italian. *Minerva Med., no. 62:941-952, 1971.*

Techniques currently available for the abatement of air pollution due to the combustion of petroleum products in domestic and industrial combustion equipment as well as in automobiles are surveyed. Smoke containing carbon particles, dust, and sulfur dioxide together with sulfur trioxide are the principal pollutants emitted by heating equipment. Dust emissions can be controlled by electrostatic precipitators with efficiencies of up to 99%, or the ground-level concentrations of both dust and SO₂ can be abated by the use of high stacks. While it is possible to abate the SO₂ emissions by fuel desulfurization, once generated, SO₂ can be retained by wet or dry processes from flue gases, such as by the Alkalized Alumina, Reinluft, or the Monsanto process. Some 33% of the SO₂ emitted into the atmosphere combines with ammonia to form harmless ammonium sulfate. Carbon monoxide, unburned hydrocarbons, hydrocarbon vapors, carbon particles, and nitrogen oxides are the principal pollutants emitted by internal combustion engines. Considerable reduction of the gaseous emission is achieved in an experimental engine by Esso Research and Engineering by the use of an electric field radially to the flame.

44338

APTIC NO. 67783

Berg, G. J. van den, P. J. J. van Doorn, and W. A. Aeberli

RESIDUAL FUEL OIL BASED POWER STATION USING PARTIAL OXIDATION. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulfurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 2, p. 39-66, 5-7, 1971. (Nov. 16-20, Paper E.3.)*

The Shell gasification process for the partial oxidation of heavy residual hydrocarbon streams is discussed. It is being used on a world-wide basis for production of synthesis gas used for the manufacture of ammonia fertilizers, methanol, and oxalcohols. It will be used in the future for the production of hydrogen. The process has been refined to the point where undesirable initial products such as soot can be recycled

to extinction within the process so that the net outflow consists only of the synthesis gas, sulfur in a recoverable form, and clean water. The energy efficiency of the process is enhanced by the use of a specially designed waste heat boiler in which high-pressure steam can be raised. Since the sulfur in the fuel is converted into an economically recoverable product (hydrogen sulfide), the use of high-sulfur fuels does not cause air pollution. Therefore, the application of partial oxidation in the form of the gasification process as an integral part of a power station constitutes an alternative to a conventional power station firing low-sulfur fuel. Costs are cited. (Author summary modified)

44339

APTIC NO. 67769

Berti, V. and A. Jannibello

DESULPHURIZATION OF CRUDE OR RESIDUAL OILS.

United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 129-131, 5-6, 1971. (Nov. 16-20, Paper A.8.)

A process for catalytic hydrodesulfurization of crude or residual oils is described. A pilot plant is operating under the following cycle: the oil mixes with the recycle gas stream, is preheated, and fed to the liquid phase reactor containing a catalyst of cobalt molybdate on alumina; the mixed phase flows to a hot stripper; a stream of hydrogen is injected at the bottom of the stripper; the desulfurized liquid residue is drained from the bottom of the stripper; the vapor phase flows into a vapor phase reactor containing a desulfurizing catalyst on a fixed bed where the desulfurization of light and medium distillates is completed. Results of some typical streams in the pilot plant are presented, including a low severity operation and medium severity operation. The average analytical data respectively of the charge feedstock and desulfurized residue and distillate are presented for the medium severity operation.

44340

APTIC NO. 67770

Blackman, L. C. F.

ADDITIONAL MATERIAL ON REDUCTION OF SULPHUR EMISSION BY LIMESTONE ADDITION TO COAL-FIRED FLUID-BED BOILERS. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 2, p. 1-7, 130-132, 1971. (Nov. 16-20, Paper H.1.)*

Fluidized combustion of coal offers considerable potential for smaller and cheaper boilers - particularly if the system is pressurized. Experiments were conducted on the reduction of sulfur emissions from coal-fired fluidized bed boilers by limestone injection. In tests with 2% sulfur coal and dolomite, after 50 hr with 0.9 stoichiometric ratio of calcium to sulfur, 55% of the S was retained. When the Ca/S ratio was 1.1 for an additional 50 hr, 87% of the S was retained. In another test with American coal and dolomite of the same size fired in the same pressurized combustor for 50 hr, 95-97% of the S was retained in the bed material for dolomite addition equivalent to a Ca/S ratio of 1.7. With a 1.1 Ca/S mole ratio, the capital cost is \$170,000, vied charges are \$41,000, and total cost is 0.028 cents/kWh; i.e., costs are \$37/ton of S collected. The emission levels of particulates, sulfur dioxide, sulfur trioxide, nitrogen oxide, chlorine, sodium, and potassium are listed. The mechanical collection of particulate emissions, problems of the fluidized combustion, driving force and heat transfer, effect of temperature on lime reactivity, low retention efficiency, gasification in fluidized beds, scale-up, unit size, size limitations, and realization of a full-scale plant are discussed.

44341

APTIC NO. 67787

Blackman, L. C. F.

REDUCTION OF SULPHUR EMISSION BY LIMESTONE ADDITION TO COAL-FIRED FLUID-BED BOILERS.

United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 2, p. 133-144, 130-132, 1971. 9 refs. (Nov. 16-20, Paper H.1.)

Fluidization of a bed of particles occurs when the velocity of gas passed through it exceeds a certain minimum value governed largely by the particle size distributions. The ensuing rapid and random movement of particles provides an environment in which mixing is rapid and the rate of transfer to immersed surfaces is very high. These features, together with the availability of a large surface area for reaction, favor the use of fluid beds for the combustion of coal. A method of reducing sulfur emissions from coal combustion by the continuous additions of relatively small quantities of limestone or dolomite to the coal feed in a fluidized bed is described. The fluidized bed is better for the injection of limestone/dolomite than conventional furnaces, because there is excellent mixing of solids in fluidized beds, particle residence times of several hours can be obtained, and the bed temperatures are within the correct range for the reaction. The reaction is described, and preliminary results of reduced sulfur emission on an experimental plant are presented. The coal ash/lime mixture waste product is being studied as a component for cement. Costs for the process are \$3.4/ton sulfur captured for labor, 0.7 cents/kWh for power, and annual fixed charges of 24% of the capital cost of the plant.

44342

APTIC NO. 67771

Blagov, I. S., V. S. Kaminsky, A. Z. Yarovskiy, and T. K. Yagofkina

PHYSICAL METHODS OF COAL PREPARATION.

United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 155-158, 135-138, 1971. (Nov. 16-20, Paper C.2.)

The sulfur content of USSR coals varies between 0.5 and 6.5% in either mineral or organic form. Mechanical preparation methods can be used to improve the quality of coal by reducing ash content. It is also theoretically possible to mechanically separate part of the mineral and organic sulfur. These mechanical (physical) methods of removing sulfur from coal are reviewed. Dense-medium classifier, hydraulic jigs, water classifiers, pneumatic classifiers, pneumatic jigs, separation on concentrating tables, and hydrocyclones and hydroseparation can be used to process the coal. Two- and three-product coal separation processes have been developed. Sulfur removal with dense-medium hydrocyclones can be from 25 to 35%; with concentrating tables from 30-35%, and with centrifugal methods from 50 to 60%. Several experimental studies are discussed.

44343

APTIC NO. 67774

Chukhanov, Z. F., A. P. Kashurichev, and V. V. Fedorov

POWER-TECHNOLOGY USE OF HIGH SULPHUR RESIDUAL OILS.

United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 210-220, 209, 1971. 3 refs. (Nov. 16-20, Paper B.1.)

Thermo-chemical treatment of fuel oil can reduce the sulfur content of fuel oil to produce sulfur as a valuable by-product. This method, called the integrated power-technology utilization of fuel oil (ETIM), involves the high-speed destructive pyrolysis of fuel oil at temperatures between 720 and 950 °C with short heating and reaction times. After the pyrolysis process, hydrogen sulfide is removed from the pyrolysis gas and processed to give sulfur. The pyrolysis gas, after ethylene and other hydrocarbons essential for the petrochemical industry and distillate fractions are removed, is used as a desulfurized fuel gas for the electric industry. The design and operation of a pilot plant are discussed.

44344

APTIC NO. 67777

Chukhanov, Z. P., E. A. Shepatina, B. I. Tyagunov, A. M. Nibolayev, S. V. Kaftanov, and S. D. Fedoseev

USE OF SULPHUR-BEARING COALS AND SHALES IN THE POWER INDUSTRY. United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 255-264, 269, 1971. 4 refs. (Nov. 16-20, Paper D.1.)

Sulfur emissions from sulfur-bearing coals and shales can be reduced in the most economical manner through the thermochemical processing of solid fuels. This method is called the complex energetic utilization of solid fuels (EITT). In the EITT process, the fuel, after being enriched, undergoes pyrolysis with maximum yield of tar and gas. Part of the sulfur is converted to hydrogen sulfide which can be extracted by ordinary methods. In most coals, 30-80% of the sulfur remains in the coke fines after pyrolysis. This S is removed through a coke fines/water vapor reaction, the quantity of circulating coke fines - the heat-carrier - being very large. In this way, S emissions by power stations can be reduced three to seven times. The EITT process is described in detail.

44345

APTIC NO. 67784

Cipera, J. and K. Prasek

UTILIZATION OF PRESSURE GASIFICATION OF LIGNITE FOR IMPROVING AIR PURITY IN CZECHOSLOVAKIA. United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 2, p. 86-101, 85, 1971. (Nov. 16-20, Paper F.1.)

Black coal and lignite constitute 97.7% of the total primary power resources in Czechoslovakia. The utilization of lignite for power generation and pressure gas production is favored because of low mining costs. Production of pressure gas by pressure gasification produces a gas of 3900-4100 kcal/cu m value of combustion heat from low grade lignite with a heat value of only 3000 kcal/kg and removes sulfur. The gasification and sulfur removal process are outlined, and the economic aspects of pressure gas production, taking account of sulfur recovery and use, are discussed.

44346

APTIC NO. 67770

Deurbrouck, Albert W.

DESULPHURIZATION OF COAL BY WASHING ON A HUMPHREY SPIRAL. United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 139-152, 135-138, 1971. 2 refs. (Nov. 16-20, Paper C.1.)

The separation of pyritic sulfur from coal offers the lowest cost operation of available methods for controlling sulfur oxide emissions. The Humphreys spiral concentrator is a widely accepted device for the concentration and recovery of various heavy minerals. Application of the Humphreys spiral to the washing of coal met with limited success in the past. The effectiveness of the Humphreys spiral for washing pyrite from 4-mesh by 6 coal was studied. The method is described, and results of the tests are presented. Coalbed samples were crushed to pass through a 4-mesh sieve and added to the spiral pump sump along with sufficient water to provide a slurry of 20% solids. The slurry was circulated over the spiral and samples were collected of the coal product, a middlings product, and a refuse product. The spiral was an effective method for washing fine size coal (35-mesh by 6). It should be considered as a competitive washing device with hydrocyclones and wet concentrating tables. There was a little advantage in using coal and mineral spirals in series when washing fine size coal.

44347

APTIC NO. 67788

Falkenberg, H. L., J. Greco, and A. V. Slack

DRY LIMESTONE INJECTION PROCESS RESULTS OF PLANT TRIALS. United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 2, p. 145-172, 130-132, 1971. 2 refs. (Nov. 16-20, Paper K.)

Many studies have been made of dry limestone injection into boilers to reduce sulfur dioxide emissions. Work on a small scale has shown several drawbacks to this system. When limestone injection was compared to limestone wet scrubbing, some important advantages of the scrubbing system were found, including better potential removal efficiency (90% or more), less danger of interference with boiler operation, and lower operating cost for large plants. The dry system has some offsetting good points such as higher final gas temperature, lower investment, simpler operation, and better suitability for intermittent operation. Dry injection is particularly suitable for smaller, older boilers where production potential for the remaining active life is not large enough to justify the higher investment for wet scrubbing. Plant tests of dry limestone injection are described on Tennessee Valley Authority boilers. The injection system, distribution of reactants in the boiler, sulfur dioxide, gas velocity, temperatures, limestone, operating variables, and results are discussed. Injection at the lower rear elevation at maximum velocity resulted in dead-burning of lime and less than 10% SO₂ removal. Reduction of injection velocity at the lower rear location increased removal efficiency to 17%. Moving the injection point to the upper rear position with maximum injection velocity increased SO₂ removal to 22%. Reduction of injection velocity to minimum lowered the removal to 18%.

44348

APTIC NO. 64363

Fiszer, W.

AIR POLLUTION CONTROL IN THE PLANTS OF THE MINISTRY OF MINING AND POWER. (Ochrona atmosfery w zakładach Ministerstwa Górnictwa i Energetyki). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 5(3):1-13, 1971.

NTIS: TT 72-54022/3

The activity of the power and mining industries in the field of air pollution abatement is discussed. Measures adopted include the provision of high efficiency dust collecting equipment, utilization of the furnace waste, and biological reclamation operations with respect to the dumps of the furnace waste. Electrostatic precipitators and mechanical collectors are the main types of high efficiency dust collectors. Sulfur dioxide emissions can be reduced by the use of high stacks and by removal of sulfur from coal before combustion. Fly ash can be utilized by recovery of iron compounds, as a component in concrete and cement, for road construction, in decorative ceramics, and in hydrophobic powders. Cinder can be used in cement aggregate, structural floor and wall tiles, alporite, and packing for mines. The total area of ash and cinder dumps in typical power plants currently amounts to an estimated 1000 ha, and each year an additional 70-100 ha are used for this purpose. Land reclamation of these dump areas is therefore needed for both economic and social reasons. The Ministry of Mining and Power in Poland coordinates activities to control air pollution, including research on control methods. These activities are reviewed. Prospects for future air pollution control are mentioned.

44349

APTIC NO. 67766

Ginsken, A. J. J. van

THE DESULPHURIZATION OF RESIDUAL FUEL OILS FROM MIDDLE EAST CRUDE OILS. United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 63-79, 5-6, 1971. (Nov. 16-20, Paper A.5.)

CONTROL METHODS

44354

Indirect and direct methods of removing sulfur from Middle East crude oils are reviewed and compared. The fuel oils produced and the costs are cited. Indirect desulfurization applying normal flashing can reduce the S content of Kuwait and Iranian heavy atmospheric residues to 2.7 and 1.7 wt%, respectively. Direct desulfurization can give 1.0 wt% S in both cases. The mixed route can produce 0.8 wt% S fuel oil. The total capital investment for S removal from atmospheric residues in a 50,000 BPSD unit is estimated at \$350-380/ton/yr sulfur removed from Kuwait material and \$470-700 for Iranian. Total operating costs, including a capital charge of 25.8%/yr on gross investment and a credit for S recovered at \$30/ton are \$180-200/ton S removed from Kuwait and \$260-370/ton S removed from Iranian heavy oil. Normal flashing leads to better economics than deep flashing. Indirect desulfurization cannot reach the fuel oil S level achievable by direct desulfurization, but has certain advantages, particularly if it is conceived as a first step followed by vacuum residue desulfurization.

44350

APTIC NO. 67790

Jonke, A. A., E. L. Carls, R. L. Jarry, and L. A. Anastasia

ANTI-POLLUTION ASPECTS OF FLUIDIZED BED COMBUSTION. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulfurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 2, p. 207-222, 130-132, 1971. 9 refs. (Nov. 16-20, Paper H.4.)*

Limestone, added to a coal- or oil-burning fluidized bed boiler can react with and remove sulfur oxides as they are formed. This method may have economic advantages over conventional combustor/boilers that employ flue gas cleaning procedures. Investigations of SO₂ emission control in fluidized beds have been carried out by several organizations in several countries. Most have been conducted in bench-scale equipment, although some tests have been made in pilot plants. Typical results achieved in these studies are described. The use of fine limestone particles has also been investigated. Typical results are shown for experiments in which coal was burned in a fluidized bed of refractory alumina to which pulverized limestone was continuously added. The work with both fine and coarse limestone has indicated that with limestone at a calcium/sulfur mole ratio of 2.0-2.5, sulfur dioxide emission can be reduced by 80-90%. In a few experiments, SO₂ control was much better than average. Different limestones and dolomites had a wide range of reactivities and capacities for reaction with SO₂. The spent ash/limestone mixture has been studied for use as a raw material for mineral wool manufacture, as a soil conditioner, as a raw material for cement manufacture, and as a neutralizer for acidic mine drainage. Regeneration of the limestone to yield calcium oxide for reuse and SO₂ for conversion into by-product sulfur or sulfuric acid has also been studied. Nitrogen oxides in the combustion gas may also be reduced by the addition of limestone. The status of the development program on limestone/fluidized bed combustion and economic considerations are also discussed.

44351

APTIC NO. 67781

Khristianovich, S. A. and V. M. Maslennikov

METHOD OF DESULPHURIZATION OF HIGHLY SULPHUROUS FUEL OIL AT POWER STATIONS BY PRELIMINARY GASIFICATION UNDER PRESSURE WITH WET GAS CLEANING. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulfurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 2, p. 29-38, 5-7, 1971. 1 ref. (Nov. 16-20, Paper E.2.)*

A method for desulfurization of highly sulfurous fuel oil at large power stations by preliminary oxidizing gasification under pressure with subsequent wet gas cleaning is described. The fuel oil is subjected to incomplete combustion in air under

pressure, with formation of a combustion gas composed principally of carbon monoxide, hydrogen, and nitrogen. The sulfur compounds are converted, for the most part, to hydrogen sulfide. The gas obtained is cooled and cleaned of soot, ash, and H₂S by scrubbing first with water and then with an absorbent. The heated, clean gas passes to the furnaces of the power plant to be used as a fuel. After deduction of the value of the by-products of fuel-oil desulfurization, the cost ranges from \$0.385 and \$0.18/ton of fuel oil.

44352

APTIC NO. 67538

Kroll, Zygfryd

FE₂O₃/H₂O-TYPE MASSES IN THE PROCESS OF DRY DESULPHURIZATION OF GASES. *(Masy typu Fe₂O₃/H₂O w procesie suchego odsiarczania gazow). Text in Polish. Przemysl Chem., 50(11):711-715, 1971. 13 refs.*

Pyrite and marcasite cinders are investigated for their ability to desulfurize gases. Marcasite cinders have ten times greater ability to react with hydrogen sulfide than pyrite cinders. Measurements of H₂S fixation on bog ore and on Lux-Laut mass under the same measuring conditions indicate that marcasite cinders are superior to the most active of the applied iron oxide/water-type masses with respect to their ability to react with H₂S.

44353

APTIC NO. 67773

Lemke, K.

REDUCTION OF THE SULPHUR CONTENT OF THE COAL BY APPROPRIATE COAL PREPARATION METHODS. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulfurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 189-200, 135-138, 1971. (Nov. 16-20, Paper C.4.)*

Methods of reducing the sulfur content of coal are reviewed. Pre-conditions for sulfur removal include: the pyritic sulfur must constitute a relatively high proportion of the total sulfur content; the pyrites must be free of or contain very little coal or dirt; and the pyrites must not be too fine. A survey was made of the sulfur content and the sulfur distribution in the coal of the Federal Republic of West Germany. Grain size analyses were also made. Then various types of coal cleaning machines were tested for their suitability for sulfur removal. The machines tested include wet cleaning (jig, wet table, froth floatation, stream tube, and wet cleaning trough machines) and drying cleaning processes (concentrating deduster, delectrostatic and electrodynamic separator, magnetic separator, dissociation of pyrites, and coal grinder for pulverized-fuel boilers machines). Results are presented.

44354

APTIC NO. 67730

Lemoine, Pierre and Gerhard Will

RED FUMES IN OXYGEN STEEL CONVERTERS. *(Les fumées rouges dans les aciéries à l'oxygène). Text in French. Metallurgie, 103(11):511-515, Nov. 1971. 8 refs.*

The problem of red fumes and methods for their abatement in oxygen converters are described. The red fume is constituted by very small iron oxide particles formed during oxygen blow in converter flue gases. The particles can be separated after cooling the hot flue gas by heat exchangers, cooling towers, and water spray. After incineration of the carbon monoxide present in the flue gas, and cooling to 130 C by water spray, it was possible to reduce the particulate content to 6 mg/cu m by means of a tissue filter at one converter plant. Flue gas cleaning after cooling by means of scrubber or dry type electrostatic precipitator is suitable for limiting the particulate content to 100 mg/cu m. The dedusted gas from these dust separators is burned in high torches.

44355

APTIC NO. 67764

Moritz, K. H. and W. Weissmann

HYDRODESULPHURIZATION OF HEAVY FUEL OILS.

United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 23-49, 5-6, 1971, 2 refs. (Nov. 16-20, Paper A.3.)

Oil supplied almost half the world's demand for energy in 1968; 40 million barrels/day were consumed in that year. By 1980, 80 million barrels will be used. Of this, roughly 1/3 is heavy fuel oil. Heavy fuel oil combustion produces sulfur dioxide. Since many countries have passed legislation restricting sulfur emissions and fuel oil sulfur content, ways to desulfurize fuel oil are being developed. The three main hydrodesulfurization routes are discussed; they are desulfurization of vacuum gas oil, desulfurization of vacuum gas oil and deasphalted oil, and desulfurization of the whole atmospheric residuum. Hydrodesulfurization of fuel oils can be accomplished by the GO-fining process for desulfurization of vacuum gas oils, thermal and catalytic cycle oils, and coker gas oils, or by the RESIDfining process for desulfurizing atmospheric residua and deasphalted oils to produce fuel oils of less than 1 wt% sulfur. The applications of these processes and their economies are discussed. To desulfurize Light Arabian gas oil to a level of 0.3 wt% S by GO-fining costs \$126/ton of S removed. RESIDfining handles residua at a typical cost of \$155/ton of S at the 1 wt% S product level.

44356

APTIC NO. 67769

Moss, G.

THE DESULPHURIZING COMBUSTION OF FUEL OIL IN FLUIDIZED BEDS OF LIME PARTICLES.

United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 2, p. 173-206, 130-132, 1971, 4 refs. (Nov. 16-20, Paper H.3.)

The fluidized bed boiler is potentially cheaper than the pulverized fuel boiler and is capable of burning fuel of poorer quality. It is also potentially a sulfur trap, removing sulfur dioxide when a lime bed is used. Experimental studies on such a system are reviewed. A low gas velocity fluidized bed combustor was used for studies of sulfur retention under oxidizing and reducing conditions. A pilot plant continuously-operating desulfurizing gasifier was also operated. It is very likely that the use of the gasifier will also substantially reduce the concentration of nitrogen oxide in the flue gas. With the assumption of successful performance of the unit, conceptual studies suggest total operating costs in the range of 20 to 50 cents/barrel for complete desulfurization, including by-product sulfuric acid being sold for \$10-15/ton.

44357

APTIC NO. 67785

Pisinen, M. K.

PRODUCTION OF LOW-SULPHUR GAS FOR LARGE INDUSTRIAL FURNACES FROM SULPHUR FUELS.

United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 2, p. 103-114, 85, 1971, 1 ref. (Nov. 16-20, Paper F.2.)

In Europe, the problem of producing low-sulfur fuel gas from sulfur fuels is limited to the processing of liquid fuels, because coal is being replaced by gaseous fuel. The possibility of gasification of liquid fuels at a refinery is discussed. The gas produced in a reactor is fed to a waste heat boiler where saturated steam is produced. The steam is fed to a steam turbine where the waste steam is used to meet refinery demand. The gasification plant thus supplies the refinery not only with fuel gas, but also with power and process steam. Hydrogen sulfide produced is absorbed by an aqueous solution of arsenium and

soda or other chemicals. The process flow-scheme for the production of low-sulfur fuel gas from sulfur mazout is also discussed. Gasification is carried out according to the same process used for coal. Estimated costs for production of low-sulfur fuel from heavy fuel oil and mazout are presented.

44358

APTIC NO. 67780

Robson, F. L. and A. J. Giramonti

AN ADVANCED-CYCLE POWER SYSTEM BURNING GASIFIED AND DESULPHURIZED COAL.

United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 2, p. 8-28, 5-7, 1971, 5 refs. (Nov. 16-20, Paper E.1.)

An advanced-cycle power system is discussed which offers the potential of reducing sulfur oxide emissions by over 95% at a busbar power cost projected to be lower than that from a conventional steam station without sulfur dioxide abatement. This station could reduce the thermal pollution of cooling water by 40%, not only because of its increased efficiency, but also because an appreciable amount of heat is rejected directly to the atmosphere in the high volume flow of stack gases. The performance and busbar power costs for stations using 1970, 1980, and 1990 technology are given. The system is a COGAS system using gas turbines in combination with a steam turbine and a high temperature, slagging gasifier to produce a fuel from coal consisting mainly of carbon monoxide, nitrogen, and hydrogen. Small-scale laboratory and pilot plant testing of this gasification process has been carried out on coal, and experiments are being run using residual oil as a feedstock. After the fuel is gasified, the fuel gas produced is sent to the COGAS power system, and pollutant gases are scrubbed and recycled to a Claus system for conversion to elemental sulfur. In the COGAS system, air is compressed, mixed with the fuel gas in the combustor, and then exhausted through the compressor drive and power turbines into an unfired heat recovery boiler. Steam from the boiler is expanded through a turbine and then condensed. Approximately 2/3 of the total power is from the gas turbine, with the remaining produced by the steam turbine. Costs for SOx abatement would be 0.29 mills/kWh at 70% annual load, busbar power costs for the COGAS system would be 5.23 mills/kWh, approximately 10% less than projected for the conventional 1980 steam station.

44359

APTIC NO. 67768

Rockett, K. W., M. J. Sterba, and C. H. Watkins

HYDRODESULPHURIZATION OF HEAVY FUEL OILS BY THE ISOMAX PROCESS.

United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulphurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, Add. 1, 1970, p. 101-126, 5-6, 1971, 4 refs. (Nov. 16-20, Paper A.7.)

Hydrodesulfurization of heavy fuel oils is a good way of reducing sulfur oxides emitted by fuel oil combustion. A black oil catalytic hydrodesulfurization technique was developed, known as the RCD Isomax process. A commercial plant in Japan reduces the sulfur content of Middle East fuel oil from 4-5 wt% to less than 1 wt% sulfur. Negotiations are under way for the licensing of five or more RCD Isomax units. Various processes to reduce the emission of SOx are reviewed, and the direct Isomax process is described in detail. The pilot plant, scale-up procedures, and commercial operating experience with direct and indirect desulfurization processes are reviewed. Process improvement potential exists with the catalysts, with the removal of hydrogen sulfide from the recycle gas, with reactor quench points, and with pollution control. Indirect desulfurization processes, which hydrodesulfurize only the heavy gas oil obtained by vacuum distillation or propane deasphalting, are being applied to reduce crudes with S contents low enough to meet the first fuel oil sulfur specifications, and to reduce crudes having metals contents too high to be processed by direct desulfurization techniques. The typi-

cal RCD Isomax process unit for direct hydrodesulfurization processing of 40,000 BPSD of desalted Kuwait reduced crude oil containing 4 wt% S and producing a 630 F fuel oil containing 1 wt% S is expected to require an investment of \$9.7 million on a U. S. Gulf Coast basis. The operating costs would be \$20,500/day, or \$0.30-0.55/barrel of reduced crude processed. If credit is taken for the sulfur, ammonia, gasoline, and distillate produced, the operating costs could drop to \$0.25/barrel.

44364

APTIC NO. 67801

Rosenfeld, A. M. and Y. N. Tuluyevskiy

CONTROL OF THE COEFFICIENT OF EXCESS AIR IN OPEN HEARTH FURNACES ACCORDING TO THE COMPOSITION OF THE COMBUSTION PRODUCT. (O kontrole koeffitsienta izbytko vozdukh v martenovskikh pechakh po sostavu produktov goreniya). Text in Russian. *Stal*, no. 8:707-711, 1971. 3 refs. (Translation available from British Iron and Steel Industry, Translation Service, 1 Carlton House Terrace, London SW1Y 5DB, England, as BISI 9785.)

Compared with other methods based on the measurement of the concentration of one of the flue gas components in open hearth furnaces for the determination and the control of the excess air coefficient, the method based on the measurement of the excess oxygen concentration was most effective during all steps of the melting process and for any furnace capacity. This method guarantees maximum accuracy at all practicable excess air coefficients, and especially in the range of 0.9-1.2 that is most important for open hearth furnace operation. The methodic error of the measurement is not greater than + or - 0.01 at 95% probability. The control of the excess air coefficient on the basis of the excess oxygen is especially effective during intense release of carbon monoxide. The excess air coefficient can be determined from the excess oxygen in the flue gases by means of an oxygen analyzer.

44361

APTIC NO. 67763

Rudolph, P. and G. Kempf

GASIFICATION OF FUELS WITH GAS DESULFURIZATION FOR THERMAL POWER PLANTS. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulfurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 2, p. 67-80, 5-7, 1971. (Nov. 16-20, Paper E.4.)*

A new power plant process using a combination of coal or oil gasification with a gas turbine process offers the following advantages: favorable conditions for desulfurization; less investment cost for the power plant; and improved thermal efficiency of coal- or oil-based power plants. Such a process is described in detail, and costs are cited. The parameters for hydrogen sulfide removal and sulfur recovery are discussed. (Author conclusions modified)

44362

APTIC NO. 67775

Schlinger, W. G. and W. L. Slater

APPLICATION OF THE TEXACO SYNTHESIS GAS GENERATION PROCESS USING HIGH SULPHUR RESIDUAL OILS AS FEEDSTOCK. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulfurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 221-231, 209, 1971. 3 refs. (Nov. 16-20, Paper B.2.)*

A hydrogen manufacturing process is described which develops the major proportion of energy required for hydrogen generation by internal partial combustion of the fuel at elevated pressure and subsequent recovery of the atmospheric contaminants from the combustion products, thus eliminating the discharge of pollutants into the atmosphere or water. The processing sequence involving the Texaco synthesis gas generation process can manufacture large quantities of

hydrogen economically from high-sulfur residual petroleum stocks. The process provides for noncatalytic, exothermic partial combustion of residual fuel oil with oxygen in the presence of steam to produce a synthesis gas composed primarily of carbon monoxide and hydrogen, containing small amounts of carbon dioxide and minor quantities of hydrogen sulfide, methane, nitrogen, carbonyl sulfide, and soot. Gases leave the combustion chamber at temperatures from 2000 to 2800 F and are quenched with hot water and saturated with steam to provide a stream that can be directly fed to a shift converter where the CO can be catalytically converted to additional H₂ by the water gas shift reaction. Soot is removed by scrubbing and recovered in a carbon recovery section where the water is contacted with naphtha. The remaining pollutants are purified by processes such as the Rectisol process employing methanol. The hydrogen manufactured can then be used for hydrodesulfurization of fuel oil. Costs are cited.

44363

APTIC NO. 67786

Schora, Frank C.

IGT HYGAS PROCESS. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulfurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 2, p. 115-124, 85, 1971. (Nov. 16-20, Paper F.3.)*

The IGT HYGAS process for conversion of coal to a high-BTU gas suitable as a substitute for natural gas is discussed. The coal is first crushed to minus 1/8 in. If it is an agglomerating variety, the coal is pretreated with air at 1 atm and 800 F in a fluidized bed reactor to destroy the agglomerating tendencies which interfere with the smooth flow of material in the hydro-gasifier. The coal is then slurried with a light hydrocarbon and the mixture is injected into a fluidized drying bed where the oil is driven off. The oil-free coal under pressure passes through two stages of hydrogasification and an electrothermal gasification stage in which about 60-70% of the coal is converted to gas. The spent char is used for fuel for conventional power plants. Steam reacts with the char to produce hydrogen and carbon oxides which, with steam, are used to fluidize and react with the coal in two countercurrent hydrogasification stages. Methane is produced and other gases are cleaned. Sulfur is removed from the system during pretreatment, hydrogasification and electrothermal gasification, and in the char leaving the system for use as fuel. The sulfur is recovered. Estimated costs are discussed.

44364

APTIC NO. 67762

Schuman, S. C.

FUEL OIL BY HYDRODESULFURIZATION - 2000 A.D. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulfurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 7-14, 5-6, 1971. 5 refs. (Nov. 16-20, Paper A.1.)*

The growth of the electric power industry in the U. S. and the increased use of fossil fuel combined with the increased need for less pollution encourage the development of fuel oil hydrodesulfurization. By 2000 A.D., energy consumption based on 5% and 7% growth estimates will be, respectively, 60 times 10 to the 15th power and 110 times 10 to the 15th power BTU/yr; equivalent respective fuel oil consumption will be 9-18 and 18-32 million barrels/day. Power plant fuel should be composed of fused aromatic structures, containing four or more rings, with hydrogen/carbon atomic ratios approximating 1.0 and molecular weights in the range of 300-500. Such fuel is more economical than petroleum residuums or coal, which are now wastefully used in power plants. These fused aromatic structures can be obtained from oil, coal, and tar sands by processes such as solvent extraction, hydro-visbreaking, and ultra-severe distillation. Total demand for such fuels by 2000 will be 46 million barrels/day. Hydrodesulfurization may be used to reduce the sulfur content from 2-12 wt% to the desired level. Major improvements in catalysis will be needed to ac-

compleish the desired end-result at an overall cost on the order of \$1/bbl. A failure to develop an adequate hydrodesulfurization process to obtain the needed fused aromatic fuels would cost an economic loss in the U. S. of \$2-7 billion/yr in 2000.

44365

APTEC NO. 67772

Supp. A. and W. Schnuerpel

PHYSICAL METHODS FOR SEPARATING PYRITE FROM SOLID FUELS WITH SPECIAL EMPHASIS ON THE BASKET SEPARATOR PROCESS. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulfurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 159-182, 135-138, 1971. 15 refs. (Nov. 16-20, Paper C.3.)*

Several physical (mechanical) methods for separating pyrite from solid fuels such as coal are described. These methods can reduce the emission of sulfur dioxide from fuel combustion. The desulfurization of fuel is preferable to stack gas desulfurization because of low investment and operating costs. Effective separation of the pyrite by physical methods requires size reduction; since the feed coal used in power plants is normally pulverized to smaller sizes, no extra cost is required for size reduction for desulfurization. In most coal seams, 40-60% by weight of the total sulfur content is present in the form of pyrite which can be removed by physical processes. Physical methods include hydromechanical extraction, pneumatic troughs, electrostatic and electrodynamic treatment, and magnetic separation. Wet processes are classified according to their suitability to remove pyrite from different size fractions. Particles above 1 mm can be cleaned by mineral jigs and dense media cyclones. Particles below 1 mm can be cleaned by wet gravity, flotation and centrifugal separation. The basket separator process is described in detail. This method was tested with different slurry samples of Ruhr coal to determine their amenability to desulfurization. Results are presented with different slurry samples with regard to the removal of sulfur-bearing and ash-forming constituents. The particle size distribution of a slurry with a wide range of grain sizes is presented. Operating costs of a basket separator would be about \$0.11/ton. Initial costs would be about \$0.075/ton. The basket separator process improves the chances of commercially utilizing slurries rich in sulfur and ash. The basket separator achieved 40-60% sulfur reduction with 20-40% reduction in ash. The maximum degree of S removal was obtained with 20-100 micron particles; and solid water suspensions containing up to 55% by volume of solids could be sorted.

44366

APTEC NO. 67778

Vestal, M. L. and W. H. Johnston

CHEMISTRY AND KINETICS OF THE HYDRO-DESULFURIZATION OF COAL. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulfurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 265-276, 209, 1971. 7 refs. (Nov. 16-20, Paper D.2.)*

A nonisothermal method developed by Juensten in which temperature is treated as a controlled variable is used to study the kinetics of the hydrodesulfurization of coal. This method eliminates the uncontrolled occurrence of chemical reactions during the time that a sample is heated to a desired isothermal reaction temperature by maintaining a constant rate of temperature increase during the experiment. The theoretical extension and experimental application of the nonisothermal method to the hydrodesulfurization of 10 bituminous coals ranging from 1-5% in sulfur content is presented. Continuous measurements of the reaction products in a flow system provided experimental functions whose theoretical interpretations identify sets of chemical reactions which are responsible for desulfurization. The kinetics of desulfurization of all ten coals are accounted for satisfactorily by five chemical reaction systems. This method gives activation energies and frequency factors

for each chemical reaction. Independent or idealized experiments were also conducted to test these results separately. In addition, the kinetics of a series of back reactions were also measured including the scavenging of the hydrogen sulfide evolved from coal by calcium oxide.

44367

APTEC NO. 67776

Zirra, I.

APPLICATION IN POWER PLANTS OF THERMO-CHEMICAL PROCESSES FOR THE DESULFURIZATION OF RESIDUAL OILS. *United Nations Economic Commission for Europe, New York, Working Party on Air Pollution Problems, Desulfurization Fuels Combust. Gases, Proc. First Semin., Geneva, Switzerland, 1970, Add. 1, p. 233-248, 209, 1971. 6 refs. (Nov. 16-20, Paper B.3.)*

Thermo-chemical processes for the desulfurization of residual oils are described. The processes involve delayed coking of petroleum residues to produce lower sulfur content. The sulfur in the feedstock is usually distributed in the gases and products which distill above 450 C. The distribution of sulfur in the products of the viscosity-breaking of a residue with high sulfur content (3.27%) is discussed. Experimental results of a small-scale pilot plant are described. By coking a feed stock with 2-3% sulfur at low pressures and with recycle ratios of 0.7/1 it is possible to obtain a 30% degree of desulfurization and reasonable yields of the cut 200-450 with low viscosity and moderate sulfur content. The use of the cut 200-450 C as diluent of highly viscous nonsulfurous residue permits the manufacture of fuels for boilers with good fluidity, excellent thermal stability, and sulfur contents of less than 1%. At the same time, the cut 200-450 C from the coking process can be used in any other blend as a fuel component for boilers. The gases and the gasoline produced by the coking process may be used in the current processes. The coke needs either to be desulfurized or used in a mixture with coke which contains a low amount of sulfur. (Author conclusions modified)

44368

APTEC NO. 64234

United Nations, Dept. of Economic and Social Affairs

PROSPECTS FOR THE DEVELOPMENT OF LESS-POLLUTING SOURCES OF ENERGY. *Preprint, 67p., June 1971. 41 refs. (Presented at the United Nations Conference on Human Environment, 1971.) (Available from Univ. Microfilms, Inc., Ann Arbor, Mich., Order no. WO 62039 2.17.)*

The history of the use of energy, particularly in the U. S., and its future are examined. Substitution between different energy sources and chemical constituents of coal are reviewed with respect to pollution by fly ash, nitrogen oxides, and sulfur compounds. The availability of low-sulfur coal is mentioned. The use of residual fuel for large-scale generation of electricity in power plants and the use of distillate fuels for automotive vehicles are also discussed. Fuel oil's sulfur content, ash characteristics, and nitrogen content can cause pollution and other problems. To prevent pollution from vehicles, external combustor on the Rankine or Brayton cycles could be developed, gasoline could be replaced with other fuels (such as hydrogen, methanol, liquefied petroleum gas, ammonia, or an economical fuel cell for on-site generation of electricity could be developed. These alternatives are reviewed. A high Btu gas can be produced by gasification of coal; this would solve the demand for natural gas and reduce pollution. New developments in the transportation of natural gas by tanker and pipeline and natural gas costs are reviewed. Nonpolluting energy sources are discussed including hydropower, solar, wind, tidal, and geothermal sources. These sources could solve the energy shortage as well as reduce pollution. Problems involving storage and transport of energy are discussed.

CONTROL METHODS

44374

44369

AFIC NO. 67742

Statens Naturvardsverk, Stockholm (Sweden)

AIR AND WATER POLLUTION PROBLEM IN FERTILIZER PRODUCTION. (Vatten- och luftvardsproblem vid tillverkning av godsselmedel). Text in Swedish. Rept. 1971-6, 126p., 1971. 8 refs.

The emissions and control of air pollutants from the fertilizer industry in Sweden are discussed. Atmospheric emissions for 1969-1970 in Landskrona totaled 100 kg/hr nitrogen compounds, 12 kg/hr fluorine compounds, 100 kg/hr sulfur dioxide, and 30 kg/hr of dust. In Koping the N₂ emissions were 170 kg/hr, phosphorus 0.2 kg/hr, F₂ 410 kg/hr, and dust 70 kg/hr. Pollution control measures are practiced: ammonia and F₂ are adsorbed, dust is removed with cyclones and filters, and residual gases containing F₂, nitrous gases, and dust are removed by scrubbing. Fluorine can also be controlled by using evaporated phosphoric acid which has a low F₂ content. Some by-products are recovered as NH₃ from a urea plant.

1970

44370

AFIC NO. 67756

Schoepfel, Roger J.

DESIGN OF A TOTAL ENERGY MANAGEMENT SYSTEM FOR THE ABATEMENT OF AIR POLLUTION. Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, Inc., Dallas, Tex., Society of Petroleum Engineers, 4p., 1970. 9 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Society of Petroleum Engineers, Gas Industry Symposium, Omaha, Neb., May 21-22, 1970, Paper SPE 2877.)

Ever-increasing utilization of fossil fuels to meet the energy requirements of an affluent society has resulted in an alarmingly high rate of air pollution. Internal combustion engines contribute about 60% of the total pollution. Since 80% of the fuel requirements for the transportation sector of the economy is shared by vehicles (mostly automobiles, buses, and trucks), the use of an alternate, nonpolluting fuel would diminish air pollution levels. An internal combustion engine has been developed which uses hydrogen instead of gasoline as a fuel. Unless a more viable solution to the air pollution problem is advanced, it is proposed that the oil industry consider the development of a total energy management system which supplies the large amounts of hydrogen at relatively low cost. The proposed system would enable optimum management of energy resources and thus place minimum strain on the delicate ecological balance of the environment. (Author abstract modified)

1968

44371

AFIC NO. 67475

Guillemic, A. F.

SMOKE CIRCUITS IN DOMESTIC HEATING FUEL OIL PLANTS (NATURAL DRAUGHT). (Le circuit des fumées dans les installations de chauffage domestique alimentées au fuel-oil (tirage naturel)). Text in French. In: Report of the Cedol Study-Day, p. 43-80, 99-117, Oct. 29, 1968. 2 refs.

Smoke circuits in domestic heating fuel oil plants (natural draft) are considered in terms of theoretical design factors which affect the boiler emissions of gaseous and particulate combustion products emerging from the chimney. The burning quality at the starting stage produces much more pollution than fixed burning conditions, with the emissions being more intense when the length of working plus off cycles is shorter. Starting conditions can be improved by widening the passage sections or by diminishing the volume of smoke to be evacuated through optimum burner settings. Pressurized burning chambers avoid difficult starting conditions and reduce un-

burned emissions. Draft regulators help starting considerably and enable the excess combustion air to be reduced, without increasing atmospheric pollution.

1965

44372

AFIC NO. 67720

Atroschenko, V. I., M. T. Ivakhnenko, and V. I. Konvizer

THE ABSORPTION OF NITROGEN OXIDES ON PERFORATED PLATES. (Isledovaniye adsorbtivnykh tselok dlya pogloscheniya oksidov azota). Text in Russian. Khim. Prom. (Moscow), 678-680, 1965.

The effect of the hole diameter and of the free cross section of the absorption plates on the efficiency of nitrogen oxides absorption in absorber columns in nitric acid production was studied in a model experiment. The nitrous gas used for the experiments contained 3.5-4% oxygen and 3.4-3.6% nitrogen oxides. The nitric acid concentration ranged from 25 to 77%, and the temperature of both the nitrous gases and the nitric acid was 35 C. The best linear gas velocity inside the absorber column was 0.25-0.5 m/sec under 3.5-6 at pressure. The optimal hole diameter and free cross-section of the absorption plates were 1.5 mm and 4%, respectively. By adopting this optimum, it is possible to reduce the number of plates by from 5 to 15%.

1955

44373

AFIC NO. 67760

Willner, A.

DUST SEPARATION BY MEANS OF ACOUSTIC AND ULTRASONIC VIBRATIONS. (Staubabscheidung mit Hilfe von Schall- und Ultraschallschwingungen). Text in German. Bergbautechnik, 5(4):201-209, April 1955. 39 refs.

The principles of ultrasonics and ultrasound generators, and the use of the ultrasonic technique for aerosol separation are described. Ultrasonic vibrations, bringing about agglomeration of small aerosol particles by multiple collisions, are especially suitable for the separation of fine, respirable dust and liquid aerosol particles for which electrostatic precipitators are usually ineffective. The ultrasonic technique requires a minimum aerosol concentration to be efficient. This minimum is approximately 2.3 g/N cu m in a fraction of 1-10 microns. The particles agglomerated in the ultrasonic tower are separated by a cyclone. The minimum residence time in the ultrasonic tower is set at 10 sec. Ultrasonic flue gas cleaners in an industrial plant in Poland separate 30,000 kg dust monthly. The use of ultrasonic dust separation in mines is being studied.

1949

44374

AFIC NO. 67750

Westh, H. Claudi

ELECTROSTATIC FILTERS. (Elektrostovfjltre). Text in Danish. Ingenioren, 58(1):36-48, 1949.

The principle, design, and practical uses of electrostatic dust precipitators are described. Electrostatic precipitators are composed of a precipitator electrode that can be in the form of a tube or plates, and of emission electrodes between the former on which d.c. high voltage is applied to generate corona discharge, or glow discharge. Under the effect of the electric field built up between the two electrodes, the charged dust particles migrate toward the precipitator electrode; the process is further promoted by electron wind that may assume substantial velocity. Electrostatic precipitators are characterized by high dust separating efficiency reaching up to 99.5%, and are used for tar separation in gasworks, for wet type dust separation in the sulfuric acid production process, and for the separation of alumina dust in aluminum hydroxide roasting.

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absorption tubes and a direct current discharge spectral emission detector is described. A preheated glass wool filter is used to remove some of the particulate mercury, while a chromosorb-W, 45-60 mesh tube treated with 10 cc hydrogen chloride removes mercury(II) chloride and the remaining particulate mercury. A chromosorb-W, 45-60 mesh tube treated with 0.05 M sodium hydroxide is used to remove methylmercury chloride. Silvered glass beads remove elemental mercury vapor, and gold-coated glass beads remove dimethyl mercury. A lower limit of detection of 0.01 ng mercury is obtained by observing the 253.65 m mercury emission line, and analyses at concentrations as low as 0.1-0.5 ng/cu m for air samples of 0.1 cu m or less can be obtained. Application of the method to analysis of air inside buildings reveals that elemental mercury is the major form of volatile mercury, though substantial concentrations of mercuric chloride and methylmercury(II)-type compounds are also present.

44381

APTIC NO. 67532

Bromberg, Steven M., Gerald G. Akland, and Berne I. Bennett
SURVEY OF LABORATORY PERFORMANCE ANALYSIS OF SIMULATED AMBIENT SO₂ BUBBLER SAMPLES. SURVEY NO. 2 (APRIL 1974). Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Quality Assurance and Environmental Monitoring Lab., 28p., Sept. 1974. 7 refs.

The quality of the 24-hour bubbler data being reported to the Environmental Protection Agency was assessed by evaluating the performance of laboratories in analyzing simulated sulfur dioxide bubbler samples. The test materials simulated ambient concentrations of SO₂ ranging from just above the detectable limit of the reference method to approximately 400 micrograms/cu m. Tolerance limits were used to judge acceptable performance which established a wider acceptable interval based on the variability of the test material. Fifteen percent (19 laboratories) accounted for 58% of the unacceptable results. The percentage of laboratories able to analyze four or five of the five samples increased from 56% in a previous survey to 73%, and the percentage of laboratories that missed four or five of the five samples decreased from 33% to 15%. (Author summary modified)

44382

APTIC NO. 67634

Bruner, Fabrizio, Paolo Ciccioli, and Filippo di Nardo
USE OF GRAPHITIZED CARBON BLACK IN ENVIRONMENTAL ANALYSIS. *J. Chromatog.*, vol. 99:661-672, 1974. 28 refs.

The versatility of graphitized carbon black as a column material for various environmental analytical problems was shown by studies on the gas chromatography of sulfur compounds and olefins in the air. Its feasibility for use in the analysis of unknown complex mixtures with widely different volatilities is reported. Good results were obtained using graphitized carbon black as an adsorbent to trap and release air pollutants, ensuring the absence of impurities that arise from the sampling technique. The experiments were conducted on gas chromatographs equipped with flame ionization detectors. Sulfur-containing gases were analyzed by equipping the chromatographs with a flame photometric detector. (Author abstract modified)

44383

APTIC NO. 64312

Carson, George A.
SAMPLING PARTICULATES IN THE INDUSTRIAL ENVIRONMENT. *ASHRAE (Am. Soc., Heating, Refrig., Air Cond. J.)*, 16(5):45-49, May 1974. 8 refs.

The general types of particulate matter present in the industrial environment and sampling methods are discussed. Industrial particulates consist of dust, respirable dust, fume, mist, and fibers. The recent emphasis on personal sampling as opposed to area sampling has produced a trend to wear small battery operated samplers. The hi-vol sampler still has some application in areas where the level of contaminants is low and per-

sonal samplers cannot collect enough dust for accurate chemical analysis. Sampling the industrial environment for respirable mass concentrations of particulate material in the workers breathing zone is currently limited to coal and silica dust. Sampling for fume is basically the same as for dusts, only that the filters used in the cassettes must be so selected to collect and retain the smaller fume particles. Most mist sampling has been performed with liquid impingers which are difficult to use, however, when trying to collect breathing zone samples. Sampling for particulate fibers is a major challenge to the industrial hygienist. Fibers are not only difficult to assay from the analytical standpoint, but their aerodynamic particle size is not completely understood and consequently it has not been determined which size of fibers are the most harmful. Two new respirable mass samplers are being designed to collect more dust in a shorter time period so that peak dust concentrations can be measured in the working environment.

44384

APTIC NO. 67464

Collis, R. T. H., P. B. Russell, E. E. Uthe, and W. Viezee
LIDAR OBSERVATIONS OF ATMOSPHERIC PARTICULATE CONTENT. Dept. of Transportation; National Aeronautics and Space Administration; T.R.W. Systems, Inc.; Army Research Office; and California Univ., Los Angeles, Dept. of Meteorology, Proc. Int. Conf. Rad. Remote Prob. Atmos., Los Angeles, Calif., 1973, p. 367-394, 1974. 45 refs. (Aug. 28-30.)

The role of lidar measurements in defining the atmospheric particulate content is reviewed. Lidar is capable of showing both in general terms and for particular circumstances the type of problems an effective radiative energy transfer model must be able to cope with in treating aerosol layers. It can further provide quantitative data on the thickness and heights of such layers for use in modelling studies. This information is also significant for remote sensing techniques that are affected by the particulate material of the atmosphere, even though such measurements might be concerned with the gaseous state or with the condition of the surface of the earth seen through the atmosphere. Lidar can provide useful and direct information on the stratospheric aerosol picture for specific purposes also and can do so more economically than in situ sensing. (Author conclusions modified)

44385

APTIC NO. 67646

Doran, T. and N. G. McTaggart
THE COMBINED USE OF HIGH EFFICIENCY LIQUID AND CAPILLARY GAS CHROMATOGRAPHY FOR THE DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN AUTOMOTIVE EXHAUST CONDENSATES AND OTHER HYDROCARBON MIXTURES. *J. Chromatographic Sci.*, 12(11):715-721, Nov. 1974. 14 refs.

High efficiency liquid and capillary gas chromatography are used in combination to examine and determine the polycyclic aromatic hydrocarbons present in automotive exhaust condensates from gasoline engines, finished gasolines, and catalytic reformates. The effect of adsorbed water and column temperature on liquid adsorption columns is discussed. The equilibrium conditions can readily be reached and maintained on Waters Porasil T by operating the chromatograph at a column temperature of 51.5 C. The problems associated with the gas chromatography of polycyclic aromatic hydrocarbons are also discussed. Adsorption problems can be reduced by using glass capillary columns, but sample recovery is incomplete. The method is suited to determination of benzo(a)pyrene and benzo(a)anthracene. Each determination can be completed in 3-4 hr, which represents a substantial time saving over previous methods. (Author abstract modified)

44386

APTIC NO. 67478

Dzubay, T. G. and R. O. Nelson
SELF ABSORPTION CORRECTIONS FOR X-RAY FLUORESCENCE ANALYSIS OF AEROSOLS.

Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., 13p., 1974. 13 refs.

A procedure is described for making self absorption corrections for X-ray fluorescence analysis of ambient air aerosols which are collected in two size ranges with a dichotomous sampler. Calculations for fine particles are based on the assumption of a uniform layer of accumulated deposit which has an exponentially decreasing depth profile within a membrane filter. Coarse particles are treated as spheres with a log normal mass distribution which is subject to modification by the sampling device. An average attenuation and the associated uncertainty is deduced for coarse particles by considering a wide variety of possible chemical compositions. (Author abstract)

44387

APTIC NO. 67741

Gordon, William A.

QUANTITATION AND DETECTION OF VANADIUM IN BIOLOGIC AND POLLUTION MATERIALS. Lewis Research Center, Cleveland, Ohio, NASA Technical Memorandum X-71497, 33p., Jan. 1974. 77 refs.

A review is presented on the sampling, detection, and quantitation of vanadium in biologic and pollution materials. Topics covered include: reagent purity and blanks, sample preparation, various detection procedures, and quantitative validation methods. Detection methods reviewed include: neutron activation analysis, emission spectroscopy, spark-source mass spectrometry, atomic absorption spectrometry, colorimetry, electrochromic methods, electron optics, X-ray fluorescence, and gas chromatography. Typical filtered samples of urban air are cited as containing as little as 50 micrograms of V, with only a small fraction of the total sample usually being available for V analysis; hence, a method of detection must have an absolute detection limit on the order of 1 ng and a relative detection limit on the order of 1 microgram/g.

44388

APTIC NO. 67673

Grant, D. W., R. B. Meiris, and M. G. Hollis

THE USE OF BENTONE 34-COATED SUPPORTS IN COLUMN CHROMATOGRAPHY AND THEIR POTENTIAL APPLICATION IN THE FIELD OF ORGANIC POLLUTION ANALYSIS. *J. Chromatog.*, vol. 99:721-729, 1974. 8 refs.

The use of columns containing Bentone 34 as a stationary phase in gas-solid chromatography (GSC) and high-performance liquid chromatography (HPLC) is discussed. Particular reference is made to potential applications in the separation of polynuclear hydrocarbons and of monohydric and dihydric phenols. A rapid separation of monohydric phenols with a high degree of meta-para selectivity is achieved in GSC columns packed with glass beads coated with a liquid-modified Bentone 34. Similarly, highly selective HPLC columns are obtained by using a Zipax support coated with Bentone 34 only. The latter give symmetrical peaks for polynuclear hydrocarbons and phenols, and measurement at the ppm level is possible using an ultraviolet monitor. (Author abstract)

44389

APTIC NO. 67454

Gregory, Gerald L., Burt R. Emerson, and Charles H. Hudgins
THREE STAGE GAS DILUTION SYSTEM FOR CALIBRATION OF AIR QUALITY INSTRUMENTATION. National Aeronautics and Space Administration, Hampton, Va., Langley Research Center, NASA-TM-X-71946, Code 67.600, 14p., April 1974. 1 ref.

NTIS: N74-25949

Tests were conducted on a three stage gas dilution system to evaluate the performance of the system for preparation of gas mixtures in the range of concentrations from 1 to 200 ppm. The test gas used in the evaluation was carbon monoxide. Mixtures of CO and air were prepared in the gas dilution system and analyzed on stream with a commercially available

infrared CO detector. Results showed the gas dilution system was accurate to within 5, 3, and 2% in the respective ranges of 1-20 ppm, 20-50 ppm, and 50-200 ppm. The gas dilution system can be used for calibration of various air pollution monitoring systems. (Author abstract modified)

44390

APTIC NO. 67633

Hartigan, M. J., J. E. Purcell, M. Novotny, M. L. McConnell, and M. L. Lee

ANALYTICAL PERFORMANCE OF A NOVEL NITROGEN-SENSITIVE DETECTOR AND ITS APPLICATIONS WITH GLASS OPEN TUBULAR COLUMNS. *J. Chromatog.*, vol. 99:339-348, 1974. 21 refs.

The sensitivity, selectivity, linear range, long-term stability, and operating conditions of a new nitrogen-sensitive thermionic detector were investigated. The detector was combined with high-efficiency glass open tubular columns in order to detect trace nitrogen-containing constituents in the complex mixtures of volatiles from human urine and tobacco aroma. A complex nitrogen profile was also obtained from a nitromethane extract of airborne particulate matter. A gas chromatograph with a modified injector and detector base was used throughout the experiments. The standard flame ionization detector was interchanged with the nitrogen detector when needed, and comparative runs were recorded under identical sampling and chromatographic conditions. The nitrogen-sensitive detector had long-term stability and reliability comparable with those of the flame ionization detector. (Author abstract modified)

44391

APTIC NO. 67511

Honma, Katsunori

ACID MIST TRACE QUANTITATION METHOD USING PH FILTER PAPER. (pH roshi ni yoru san misuto no biryo teiryoho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), no. 6:64, 1974.

To eliminate some of the shortcomings of the filter paper measurement method for acidic particulates, pH test paper was improved and an effective method of quantitation was discovered. After examining various pH indicators, timor blue (coloration range pH 1.2-2.8) and brom phenol blue (coloration range pH 3.4-6) were selected, using the former for strong acid and the latter for total acid. The filter used was the membrane type. The indicator was dissolved in 1 to 1 ethanol and water mixture to make an 0.2% concentration, and 10 vol% glycerine was added. To achieve stronger coloration, 0.5% of an 0.1 N sodium hydroxide solution was added to timor blue and 4 vol% was added to brom phenol blue. The filter paper was soaked and after coloring the paper was washed completely and dried in the room temperature. In this experiment, the mist was drawn by a pump for filtering. Photoelectric colorimetry was used for measuring the change of the color by acid mist. The reflection intensity is usually influenced by the particulates other than acidic substances, but since the pH filter changed the color on both sides, the quantity of acidic particulates could be easily determined without the interference of other particulates.

44392

APTIC NO. 67573

Imagami, Kazunari

MEASUREMENT OF DUSTS AND PROBLEMS. (Baijin no keisoku to mondaiten). Text in Japanese. Bunseki Kiki (Analysis Instr.), 12(5):286-292, May 1974. 13 refs.

The Japanese Industrial Standard Z 8806 for flue gas dusts measurement method presents a number of problems since the dusts are contained in high temperature, high humidity gases. The JIS method specifies an iso-speed gas suction sampling; but the adjustment of the sampling probe to the gas flow velocity is difficult and complex because such factors as gas temperature, water content, static pressure, atmospheric pressure, and specific weight must be taken into consideration and a precision calculation is required. The JIS specifies for the

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filter material for the sampler a more than 99% collection rate and resistance to any chemical changes; it must also be free of any cadmium or lead in the material itself, since they may affect the measurements of Cd and Pb in the dusts. The level (balance) sampler, kinetic pressure comparison sampler, filter materials, and a few pointers in measuring flue gas dusts are discussed.

44393

APTIC NO. 63783

Ishiguro, Tatsukichi, Yoshiteru Iwasaki, Hiroshi Fukushima, and Shunkichi Onozuka

POLLUTANTS IN URBAN REFUSE INCINERATION GASES AND THE MEASUREMENT METHODS. CONTINUOUS INCINERATOR (1). (Toshi gomi shokyakuro no haigenshu no osenshitsu to sono sokuteiho: renzoku kikai no baai(1)). Text in Japanese. Toshi to Haikibutsu (J. Solid Waste), 4(5):38-40, May 1974.

A Takuma type continuous combustion incinerator, which was constructed in 1970, was subjected to an examination in order to study methods of sampling and analysis of combustion gases. The incinerator has a capacity of 300 tons/day (two incinerators), a total stack gas emission of 132,000 N cu m/hr, a stack height of 100 m, and an effective stack height of approximately 130 m. The measurement of pollutants is affected by the combustion conditions and composition of refuse. The concentration of emission gases changes depending on the quantity and quality of the refuse and fuel, the structure of the incinerator, the combustion temperature, oxygen concentration (air ratio), and gas retention in the combustion chamber. Generally, a chemical analysis method (manual) yields extremely inaccurate measurements confined to several minutes or at most several tens of minutes. The emission composition measured in this manner does not mean it can pass the emission standard. The emissions for the total 8760 hours of the year must be examined. However, continuous analysis methods are not available at the present time. There is no continuous analyzer equipment for combustion gas hydrogen chloride. The presently used SO₂ meter also is unsatisfactory for use in an incinerator.

44394

APTIC NO. 67652

Knight, G., R. Kowalchuk, and R. Yourt

DEVELOPMENT OF A DUST SAMPLING SYSTEM FOR HARDROCK MINES BASED ON GRAVIMETRIC AND QUARTZ ASSESSMENT. *Am. Ind. Hyg. Assoc. J.* 35(11):671-680, Nov. 1974. 30 refs. (Presented at the American Industrial Hygiene Conference, Minneapolis, Minn., June 1-6, 1975.)

The dust sampling results obtained in laboratory and field studies are analyzed. It was possible to use fixed position or personal size-selecting gravimetric dust samplers (small battery-powered units) with silver membrane filters and to assess the respirable dust concentrations in terms of total dust, the quartz portion (by direct X-ray diffraction on the sample), and the combustible portion (after ashing). Both dust concentration and dust composition are very variable, and a number of shifts need to be sampled to give a reasonable estimate of the dust exposure. Because of this variability, statistical design and analysis of a sampling program are necessary to minimize costs and to maximize information. (Author abstract)

44395

APTIC NO. 67899

Kohr, Horst

SMOKE DETECTOR. (Pyrotektor Europe GmbH, Sulzburg/Baden (Switzerland)) U. S. Pat. 3,799,670. 5p., March 26, 1974. 5 refs. (Appl. Aug. 21, 1972, 5 claims).

A smoke detector based on the reflected light principle is described which allows for a greater ratio of smoke to no-smoke resistance of the photocell detector and easier assembly as compared with prior art designs. A molded mounting plate and a molded retaining plate cooperate with a cylindrical labyrinth from either side. The molded components are pro-

vided with inter-engaging portions to eliminate any possibility of improper assembly. One embodiment of the invention involves the positioning of a photocell such that it views the dark chamber through the mounting plate axially of the labyrinth wall, whereby the reflected light received by the photocell under conditions of no-smoke is a minimum. Another embodiment of the invention involves the use of the mounting plate to also support the various electronic components of the detector circuit. (Author abstract modified)

44396

APTIC NO. 67619

Kondo, Masaomi

SAMPLING AND MEASUREMENT OF ORGANIC CYANOGEN COMPOUNDS (ACRYLONITRILE, ACETONITRILE, ACETONE CYANOHYDRIN). (Yuki shian kagobutsu (akurironitoriru, asetonitoriru, asetonshienhidorin) no hoshu to sokutei). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 30, p. 83-88, July 1974.

Organocyanogen compounds were introduced through a K₂CO₃ (potassium carbonate) drying tube to sample collecting tubes containing pure water. Desirable conditions for sampling acrylonitrile, acetonitrile, and acetone cyanohydrin in air were air flow rate 500 ml/min, total air sampling 10 l, and cooling temperature of collecting tube 0°C. A given amount of sample solution was injected into a gas chromatograph and the concentration was determined by comparing with standard sample. The GC conditions were: 4 mm i.d. by 200 cm column packed with 15% PEG 6000 with 60/80 mesh Celite 545 as support; column temperature 90°C; carrier gas nitrogen at 30 ml/min. The limits of detection of the organocyanogen compounds in air were 3.46 ppm for acrylonitrile, 2.15 ppm for acetonitrile, and 4.46 ppm for acetone cyanohydrin.

44397

APTIC NO. 67632

Kuriyan, J. G., D. H. Phillips, and R. C. Willson

DETERMINATION OF OPTICAL PARAMETERS OF ATMOSPHERIC PARTICULATES FROM GROUND-BASED POLARIMETER MEASUREMENTS. *Quart. J. Roy. Meteorol. Soc. (London)*, 100(426):665-677, Oct. 1974. 22 refs.

The theoretical analysis required to infer, from polarimeter measurements of skylight, the size distribution, refractive index, and abundance of particulates in the atmosphere is described. To illustrate the viability of the method, some data obtained at Los Angeles are analyzed, and the atmospheric parameters are derived. The explicit demonstration of the redundancy in the description of aerosol distributions suggests that radiation field measurements will not uniquely determine the modal radius of the size distribution. In spite of this, nonuniqueness information useful to heat budget calculations can be derived. (Author abstract modified)

44398

APTIC NO. 67537

McClenny, W. A., L. R. Snowman, and R. J. Gillmeister

OPEN PATH MONITORING OF AMBIENT OZONE.

Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Div. of Chemistry and Physics; General Electric Co., Syracuse, N. Y., Electronics Lab.; and General Electric Co., Pittsfield, Mass., Ordnance Systems, 20p., 1974. 16 refs.

Ambient levels of ozone were monitored over path distances of 0.67 km. A carbon(12) oxygen(16) laser with sequential and repetitive pulse outputs at four wavelengths in the infrared and a unique signal processing technique for return signal analysis was used. Agreement with simultaneous point monitor measurements of O₃ constitutes the first validated measurements of trace gas concentrations using such a system. An inherent tolerance in agreement of plus or minus 12 ppb for a given path averaged O₃ concentration is related to the point monitor, to path monitor comparison accuracy, and to unaccounted for variations in atmospheric transmissivity. Instances of spurious

O₃ variations as measured by the path monitor are attributed to correctable techniques for signal processing and to beam wandering at the remotely placed retro-reflector. (Author abstract modified)

44399

APTIC NO. 67912

McClenny, William A., Ralph E. Baumgardner, Jr., Frederick W. Baily, Jr., and Rebecca A. Gray

METHODOLOGY FOR COMPARISON OF OPEN-PATH MONITORS WITH POINT MONITORS. *J. Air Pollution Control Assoc.*, 24(11):1044-1046, Nov. 1974. 7 refs.

The first measurements of a dispersed secondary pollutant (ozone) using a carbon dioxide laser based, open-path monitor are compared to readings from a chemiluminescence point monitor which traverses a common measurement path of 0.67 km. A statistical treatment is given which establishes the accuracy of comparison. Meteorological conditions as reflected by changes in pollutant variability influence the accuracy of comparison. The essential equivalence of data obtained by the point monitor and the path monitor is confirmed for selected measurement sequences, while other measurement sequences identify nonoptimized performance of the path monitor. This and similar work may provide the basis for establishing equivalency standards for path monitors. In the future path monitor, stationary point monitor comparisons will be used in studies to establish the adequacy with which a point monitor represents the area assigned to it in regional monitoring networks. (Author abstract modified)

44400

APTIC NO. 67674

Meyer, Jeffrey A.

QUANTITATIVE DETERMINATION OF VOLATILES IN NON-VOLATILE MATRICES. *J. Chromatog.*, vol. 99:709-720, 1974. 5 refs.

An integrated vacuum distillation-gas chromatographic method was developed for measuring total volatiles content and absolute levels of specific volatiles in polymers and other relatively nonvolatile matrices. The method is very versatile and is used for the simultaneous determination of moisture and organic volatiles over the range 0.0005% to 40% by weight with a precision of + or - 4% relative. The lower limit of detection for hydrocarbon volatiles is 1 ppb with flame ionization detection. Specific applications to the quantitative determination of hydrocarbon volatiles in high-density polyethylene, moisture and hexane in atactic polypropylene, and a trace odorant in high-density polyethylene are presented. (Author abstract)

44401

APTIC NO. 67748

Mironova, T. L., M. V. Nikolayeva, and D. A. Vyakhirev

GAS-CHROMATOGRAPHIC DETERMINATION OF THE ABSOLUTE SOOT CONTENT IN EXHAUST GASES. (*Gazokhromatograficheskoye opredeleniye absolyutnogo kolichestva sazhi v otrabotannykh gazakh*). Text in Russian. *Zavodsk. Lab. (Moscow)*, no. 8:942, 1974.

A gas-chromatographic method for the quantitative determination of the total soot content in automotive exhaust gases is described. The soot present in the exhaust gases is retained on a temperature-resistant filter with 80 micromesh pores. After sampling, the filter with the soot retained on it is transferred into a pyrolytic chamber for the quantitative incineration of the soot in air. Gas samples from the pyrolytic chamber are analyzed for their carbon dioxide and carbon monoxide contents for the indirect determination of the carbon content in the exhaust gas. The method has an error of 2.75%. The soot content in exhaust gases ranges from 0.013 mg/l to 0.024 mg/l.

44402

APTIC NO. 67664

Murino, Pasquale and Pasquale Erto

VARIABILITY AND ITS CAUSE IN THE MEASUREMENT OF POLLUTANT EMISSIONS IN AUTOMOTIVE EXHAUST ACCORDING TO THE EUROPEAN CYCLE. (*Variabilita delle misure di emissioni inquinanti*

allo scarico delle autovetture secondo la procedura europea: indagine sulle cause). Text in Italian. *Ingegneria (Milan)*, 49(4):147-152, April 1974. 7 refs.

The variability and its causes in the measurement of automotive pollutant emissions according to the European Cycle were studied in actual exhaust emission measurements on a dynamometer stand. It was found possible to run the cycles at a variability of about 20%, i.e., with 80% correlation. The variations in the prescribed cycles, manifesting themselves in variations of the depression, and the carbon monoxide and unburned hydrocarbon concentrations, were due mainly to the individual variations in driving the cycle within the tolerated limits as prescribed for the European Cycle. The hydrocarbon emissions were less susceptible to the high-frequency variations in the operating conditions of the engine than were the CO emissions, but they were strongly influenced by the wide-range variations in the operating conditions due to shifting. The variations in the operating conditions can be substantially reduced by automatization of the dynamometer stand by the use of computer.

44403

APTIC NO. 67639

Nation, G. H.

A PORTABLE APPARATUS FOR THE DETERMINATION OF NITROGEN OXIDES. *J. Inst. Fuel*, 47(392):199-202, Sept. 1974. 8 refs.

A low-cost portable nitrogen oxide analyzer with good reliability was designed to complement the more costly continuous reading instruments presently available. The analyzer uses the well-established colorimetric reagent developed by Saltzman to determine both nitric oxide and nitrogen dioxide. A versatile gas handling system allows analysis of combustion gases with nitrogen oxide concentrations in the range of 0-1000 ppm. The design, calibration, operation, and maintenance of the apparatus are reviewed. (Author abstract modified)

44404

APTIC NO. 67651

Okada, Yoshitaro

THE CONTINUOUS AUTOMATIC DUST MEASUREMENT SYSTEM, CONY TEST. (*Renzoiku jido baijin sokutei sochi koni tesuto*). Text in Japanese. *Kankyo Sozo (Environ. Creation)*, 4(10):67-71, Oct. 1974.

The principle and mechanism, performance, calibration method, error factors, and maintenance pointers for the newly developed automatic dust measurement apparatus, Cony (?) Test, are discussed. The equipment utilizes the principle of friction electrification by passing dust containing gas through an exciter tube made of special material and causing collision and friction by centrifugal force. The microelectric currents generated in the exciter tube are amplified and caught by the signal apparatus, and the instantaneous value and cumulative value are recorded. The dusts passing the exciter tube are collected by a filter, dried, and weighed and the dust weight concentration is measured for current output calibration. All the usual error factors cause minimal problems in this equipment; the current output and dust concentration maintain the relationship of the primary equation while the particle distribution and dust properties are constant and concentration is within 0.8 g/N cu m. The equipment is usually installed in the back of an electrostatic precipitator and errors by electrification of dusts are nil. The errors caused by uneven flow speed suction calculated by the Watson equation are, when apparent specific weight is 2 g/cu cm and + or - 25% uneven speed, within + or - 5%. The errors caused by high gas temperature are also minimal because the sensor temperature is controlled and maintained within 190 C-220 C, and the temperature changes in the duct do not affect the sensor.

44405

APTIC NO. 67753

Petty, R. R., G. M. Russwurm, W. A. McClenny, and D. R. Morgan

CO₂ LASER ABSORPTION COEFFICIENTS FOR DETERMINING AMBIENT LEVELS OF O₃, NH₃, AND C₂H₄. Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Div. of Chemistry and Physics and General Electric Co., Syracuse, N. Y., Electronics Lab., 20p., 1974. 14 refs.

A carbon dioxide laser source was used to determine absorption coefficients for dilute absorber-air mixtures at wavelengths corresponding to several vibration-rotation lines in each branch of the 00 deg 1-02 deg 0 band at 9.4 micron and the 00 deg 1-10 deg 0 band at 10.4 micron. For all samples the total pressure was one atmosphere and the temperature was 300 K; the concentrations ranged from 10 to 357 ppm for ammonia and ethylene and from 10 to 80 ppm for ozone. The absorption coefficients are tabulated, and the use of selected laser lines in monitoring ambient concentrations is discussed. (Author abstract)

44406

APTIC NO. 67993

Fedder, M. A.

NOTE ON THE SMALLEST PARTICLES DETECTED BY CONDENSATION NUCLEUS COUNTERS. *Atmos. Environ.*, 8(10):1061-1062, Oct. 1974. 2 refs.

The smallest radius of particles effecting condensation in a Pollack counter operating at the standard 1.21 expansion ratio was deduced from measurements of the diffusional decay inside the counter itself of spontaneously produced aerosol particles. The smallest radius is typically 1 + or - 0.1 nm in such aerosols; very close to the most generally quoted size limit of detection for this and similar condensation nucleus counters. (Author abstract)

44407

APTIC NO. 67584

Sakata, Mamoru

PRESENT STATUS AND PROBLEMS OF THE METHODS OF MEASUREMENT OF NITROGEN OXIDES. (*Chisso san'abutsu sokutei gijutsu no genjo to kadai*). Text in Japanese. *PPM (Japan)*, 5(10):2-11, Oct. 1974.

Measurement of environmental nitrogen oxides concentration and that of NO_x at the site of appearance of NO_x are separately discussed because the concentration of the former is on the level of 0.1-0.02 ppm, whereas that of the latter is at the level of 1000 ppm. The former measurement is made either by chemical methods or by automatic or physical methods. Of the chemical methods, the naphthyl ethylenediamine method and the Saltzman method are the most popular. Most popular automatic methods of analysis are absorption spectroscopy and the chemical emission method. For the determination of the NO_x concentration at the site of appearance, chemical methods such as the PDS method, the nitrate ion-electrode method, the zinc reduction NEDA method, and the continuous methods such as the chemical emission method, infrared absorption, ultraviolet absorption, the potentiostatic coulometric method, and the potentiostatic electrolysis method are used. At present, the reliability of various methods for the quantitative determination of NO_x is doubtful. The American Environmental Protection Agency suggests that the effect of oxidants cannot be ignored at NO_x concentrations below 0.1 ppm, when a continuous analyzer of the Saltzman type is used.

44408

APTIC NO. 67672

Seim, H. J., W. W. Hanneman, L. R. Barsotti, and T. J. Walker

DETERMINATION OF PITCH VOLATILES IN AIRBORNE PARTICULATES. I. PROBLEMS WITH THE BENZENE-SOXXHLET EXTRACTION METHOD. *Am. Ind. Hyg. Assoc. J.*, 35(11):718-723, Nov. 1974. 7 refs. (Presented at the American Industrial Hygiene Conference, Minneapolis, Minn., June 1-6, 1975.)

The benzene-Soxxhlet extraction determination of coal tar pitch volatiles collected with personnel samplers is shown to be an inaccurate procedure. At present, results are calculated from the weight loss of filters on extraction. In reality, they reflect mechanical losses of filter media and particulate. In addition, plasticizers in certain cassettes are adsorbed onto the filters and are subsequently extracted, which partially explains the high blank values associated with the method. The experimental evidence supporting this conclusion is summarized, and a basis for the development of an acceptable analytical method is given. (Author abstract)

44409

APTIC NO. 67638

Sudo, Teruyuki

ANALYTICAL METHODS FOR LOW CLASS ALDEHYDES AS BAD ODOR ELEMENTS MIXED IN HYDROCARBONS. (*Tanka suisorui to konzai suru akushu seibun to shite no teikyū arudehidorui no bun-sekiho*). Text in Japanese. *Akushu no Kenkyū (Odor Research J. Japan)*, 4(16):19-26, Aug. 1974. 24 refs.

As a method of analyzing low class aldehydes, couplet columns packed with glass beads were successfully used for gas chromatography for separating and quantitating acetaldehyde, isobutyl aldehyde, n-butyl aldehyde, and acetone. The condensation method, transfer of condensed air from the condensation tube A to the condensation tube B, separation of acetaldehyde, isobutyl aldehyde, n-butyl aldehyde, and acetone using a precolumn, dummy column, main column and choke column, quantitation and identification by elimination, calibration, and the method of preparing standard gas are described. The concentration rate of n-pentane, dimethyl sulfide, isobutyl aldehyde, isopropanol, methyl acrylate, methyl isopropyl ketone, 3-methyl heptane, octene-1, and toluene ranged from 71 to 104%, and the rate of transferring condensed gas from tube A to tube B was between 83 and 98%. When aldehydes were relatively highly concentrated in the air, only tube A was used, and when the concentration was low, tube B was used for concentration of about 20 l of air. The transfer of the concentrate was necessary for leading the gas into gas chromatography. The precolumn was a conboil-20 with small polarity, and the main column was TCEP + sulfonic N-300, and by leading the material while heating with an accurate precut in 2 min, trace acetone and C₂-C₄ aldehydes of more than 10 ppb were successfully measured.

44410

APTIC NO. 67683

Tarasov, V. V.

GAS-CHROMATOGRAPHIC DETERMINATION OF CARBOXYLIC MONOACIDS C₂-C₆ IN THE AIR. (*Gazokhromatograficheskoye opredeleniye odnoosnovnykh karbonovykh kislot C₂-C₆ v vozdukh*). Text in Russian. *Gigiena i Sanit.*, no. 8:49-51, 1974.

A gas-chromatographic method for the determination of carboxylic monoacids with 2 to 6 carbon atoms, such as acetic acid, propionic acid, oleic acid, caproic acid, and valeric acid, in workplace air is described. Air is sampled at a rate of 1 l/min through silica gel from which the sample is extracted with hexane. The gas-chromatographic determination is done on glass column with chromatone N, silanized GMDS, and 10% polyethyleneglycol adipinate as liquid phase. Differential type DIP detectors are used for the determination, and the column is heated up from 100 to 150 C at a rate of 10 C/min. Under such conditions, gas-chromatographic separation and determination is possible simultaneously in the presence of furfural. Acetone, acrolein, and monocarbonyl aldehydes with 2 to 5 micron atoms do not interfere with the determination.

44411

APTIC NO. 67671

Uehara, Hiromichi and Yasuharu Ijuuin

A SENSITIVE MICROWAVE CAVITY SPECTROMETER: DIRECT DETECTION OF FORMALDEHYDE IN AUTOMOBILE EXHAUST. *Chem. Phys. Letters (Amsterdam)*, 28(4):597-599, Oct. 15, 1974. 4 refs.

A newly constructed sensitive microwave cavity spectrometer of the Stark-dc-voltage sweep type was studied. It revealed that formaldehyde in concentrations as small as 0.2 ppm can be directly detected by using the 7(sub 25) left-heading arrow 7(sub 26) rotational line. The cavity resonator is operated in the rectangular TE(sub 1,0,20) mode. A sample of automobile exhaust showed a strong spectrum indicating a concentration of 24 ppm of formaldehyde. (Author abstract)

44412

APTIC NO. 67592

Ueno, Hiroshi and Makoto Kikuchi

A FLUE GAS METER - A CALCULATION METHOD FOR MULTI-COMPONENTS UTILIZING ULTRAVIOLET RAY ABSORPTION. (Endo gasu sokuteiki - shiginen kyushuho o oyo shita taseibun enzanho). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(8):46-51, Aug. 1974. 9 refs.

A flue gas meter for the simultaneous measurement of sulfur dioxide, nitric oxide, and nitrogen dioxide was developed based on the multi-components calculation method using ultraviolet absorption and marketed as Mitsubishi flue gas meter model SA-302. The description of measurement principles, structure of the meter, operational procedures, and specifications are given. The characteristics of model SA-302 are discussed in terms of the effect of coexisting gases, linearity of measured values, and response characteristics. Some of the advantages given are as follows: the simultaneous measurement of nitrogen oxides concentration as well as SO₂, NO, and NO₂, independence of the effect of water, carbon dioxide and ammonia, automatic zero point adjustment and minimal drift, minimal span drift, quick response with 90% of the response within 30 sec, simple maintenance involving no chemical processes, and stable long term measurement with high accuracy.

44413

APTIC NO. 67438

Vijan, P. N. and G. R. Wood

AN AUTOMATED SUBMICROGRAM DETERMINATION OF ARSENIC IN ATMOSPHERIC PARTICULATE MATTER BY FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY. Atomic Absorption Newsletter, 13(2):33-37, March-April 1974. 6 refs.

A highly sensitive automated method for the determination of arsenic in atmospheric particulate matter using flameless atomic absorption spectrophotometry is described. The aerosol is collected on glass fiber filters, and a measured portion of these filters is digested with a 1:2 nitric:sulfuric acid mixture. The chemically bound arsenic is reduced to arsine with sodium borohydride, and the arsine gas is swept with argon through a heated, windowless quartz cell for atomic absorption analysis. A mechanical sampler, a proportioning pump, and a gas-liquid separator are used to achieve automation. Sensitivity of detection by the techniques is 1 ppb arsenic. Analytical results demonstrate good precision and uniform distribution of arsenic across the filter surface. The possibility of using the technique for the determination of other metals is cited. (Author abstract modified)

44414

APTIC NO. 67653

Wellinger, Robert and Paul M. Giever

SENSITIVITY AND ACCURACY OF THE H₂S SAMPLER. Am. Ind. Hyg. Assoc. J., 35(11):730-734, Nov. 1974. 2 refs. (Presented at the American Industrial Hygiene Conference, Minneapolis, Minn., June 1-6, 1975.)

A test program was conducted to check the sensitivity and the accuracy of the hydrogen sulfide paper test sampler as it has been used since its introduction several years ago. Test data from this sampler were compared with those from a sampler modified by researchers from the San Francisco Bay Area Air Pollution Control District. A Mylar bag was used as a container into which laboratory air and a measured quantity of reagent-quality H₂S were placed to produce a sample of known

concentration. A Research Appliance Company standard G25E sampler with a recorder was used to draw the sample from the bag and to read the tape. The data show that the modifications made by the Bay Area Pollution Control District increased the sensitivity over the 0- to 60-ppb range; however the shape of the modified curve remained the same as that of the original curve. The data also showed that the percentage of accuracy remained approximately the same on both the modified and the original curves, the magnitude of the plus or minus readings around a mean point on the modified curve being approximately the same as that of the original curve. (Author abstract)

44415

APTIC NO. 67696

Williamson, W. R., D. R. Shafer, and D. C. Diworth

LOWER ATMOSPHERE COMPOSITION AND TEMPERATURE EXPERIMENT. Opt. Eng., 13(4):303-306, July/Aug. 1974.

The Lower Atmospheric Composition and Temperature Experiment (LACATE), is described in regards to an optical system to be feasibility-tested on a balloon flight. The ultimate objective of the project is to determine the vertical distribution of certain atmospheric constituents and temperature on a global scale from the upper troposphere through the stratosphere and into the lower mesosphere. The experiment calls for measurements to be made in each of nine spectral regions: two near the 15 micron carbon dioxide band, and one each at the 6.2 micron nitrogen dioxide band, 6.3 micron water band, 7.5 micron methane band, 9.4 micron ozone band, 10.5 micron aerosol band, 11.3 micron nitric acid band, and the 17.5 micron nitrous oxide band. A programmed scanning mirror attached to a radiometer causes the fields of view of the detectors to make a vertical scan across the earth's horizon, with azimuth coverage being obtained by commanding the scanning mirror to desired azimuthal pointing directions.

44416

APTIC NO. 67687

Yasui, Arata, Toshikatsu Uchida, Kazuo Okajima, Choku Ochi, and Toshio Matsui

A METHOD OF CALCULATING THE WEIGHT CONCENTRATION OF SUSPENDED PARTICULATE MATTER. (Fuyu ryushijo busshitsu no juryo nodo sanshutsuho ni tsuite). Text in Japanese. Proc. Conf. Environ. Health, 18th, Fukui, Japan, 1974. p. 71-72. (Oct. 3-4.)

With the enforcement of environmental standards, the suspended particulate concentration monitored by digital dust meter is corrected with the value obtained by the weight concentration method for the evaluation. At two air pollution monitoring centers in Fukui Prefecture, the suspended particulate concentrations were measured simultaneously using digital dust meter (D value) and low volume air sampler (LV value). Both D value and LV value showed log normal distribution. The monthly average Ft value (LV value/D value) showed considerable variation, and the regression line intercepted at y equals 27.3 microgram/cu m. There was an inverse correlation between the Ft value and relative humidity.

44417

APTIC NO. 67892

Zavorovskaya, N. A., Y. V. Nekhorosheva, and V. A. Simonov

THE USE OF SOLID SORBENTS FOR AIR SAMPLING FOR THE IR SPECTROPHOTOMETRIC DETERMINATION OF POLLUTANTS (ADSORPTION OF 2,4-TOLUENE DIISOCYANATE FROM AIR, AND ITS DESORPTION BY CARBON TETRACHLORIDE).

(Isopol' zovaniye tverdykh sorbentov dlya otbora prob vozdukh pri opredelenii vrednykh veshchestv metodom infrakrasnoy spektrofotometrii (pogloshcheniye iz vozdukhha 2,4-toluilendizotsianta i yego desorbtsiya chetyrekhloristym uglerodom)). Text in Russian. Gigiena i Sanit., no. 7:53-55, 1974. 5 refs.

The adsorption of 2,4-toluene diisocyanate in air on various solid sorbents and desorption by means of carbon tetrachloride were studied to determine the optimum sampling procedure for the infrared spectrophotometric analysis of this compound. While silica gel, porcelain, fireclay, zeolite, iodized activated carbon, faience, and kaolin retained 2,4-toluene diisocyanate quantitatively, and ammonium sulfate, sodium sulfate, sodium carbonate, and sodium chloride in a grain size range of 0.3-1.6 mm did at a rate of 60-80%, none of the above solid sorbents guaranteed efficient desorption by carbon tetrachloride. Therefore, porcelain in a grain size range of 0.8-1.6 mm was treated with petrolatum oil dissolved in carbon tetrachloride to increase the rate of desorption. After evaporation of the solvent, the amount of petrolatum oil applied on the porcelain support amount to 5 wt%. This sorbent was best for the adsorption and retention of 2,4-toluene diisocyanate.

44418

APTIC NO. 63440

CONTROLLING FUEL OIL COMBUSTION. INDUSTRIAL MEASUREMENT METHODS ADOPTED BY ELECTRICITE DE FRANCE. (*Contrôle de la combustion du fuel-oil. Methodes industrielles de mesure utilisees a Electricite de France*). Text in French. Tech. Moderne, 66(4):13-20, April 1974.

Industrial methods adopted by Electricite de France for the control of gaseous and particulate pollutant emissions and of corrosion hazards in fuel oil-fired thermal power plants are described. The flue gas flow rate, the flue gas oxygen and pollutant contents, flue gas opacity, as well as dew point and corrosion control were performed at principal sampling points, such as the economizer outlet, and the outlet of the last heat exchanger. The oxygen content in the flue gases were determined by industrial chromatograph, by the solid electrode, or the paramagnetic method. The hydrogen content was investigated by chromatographic procedure. Sulfur trioxide and sulfur dioxide were analyzed by acidimetric method. The SO₂ and SO₃ concentrations in the flue gases were in the respective ranges of 150-2000 ppm and 5-100 ppm. The nitric oxide and nitrogen dioxide concentrations varied from 100 to 1000 ppm. Opacimetry, Bacharach apparatus, and Bertin's probe were used for the evaluation of the particulate content in the flue gases. The hazards of low-temperature corrosion due to SO₂ and SO₃ were controlled by conductimetric method at flue gas flow rates comprised between and 12 m/sec and temperatures over dew point but below 350 C. Corrosion was studied by means of soft steel semicircles placed in the flue gas duct.

44419

APTIC NO. 67678

MONITORING FURNACES IN THE CERAMIC INDUSTRY BY MEANS OF GAS ANALYZERS. (*Gasanalytische Ueberwachung von Industrieöfen in der Keramikindustrie*). Text in German. Sprechsaal, 107(17): 743, 1974.

The automatic gas analyzer K-Duplex MONO E 4805 for the continuous recording of carbon dioxide, carbon monoxide, and hydrogen content in the oven atmosphere in the ceramic industry is described. The readout of the instruments permits the control of the oven atmosphere composition from the oxidizing to the reducing range by modifying the air-excess coefficient. Gas samples are taken at short intervals, and the sample is led through an oven to oxidize CO and H₂ to CO₂ and water, respectively. The oxidizing atmosphere is achieved by reducing the CO₂ content in the oven gas by increasing the air supply to prevent the formation of CO₂ and H₂.

1973

44420

APTIC NO. 67399

Beach, G. H.

THE STACK TEST - FINAL PROOF OF NON-POLLUTION. Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 26-37. 5 refs. (Oct. 14-16.)

Once a baghouse is installed, it is important to know whether the required level of emission control is achieved. The determination of the degree of control accomplished is made at the baghouse outlet by making a stack test. The problems associated with sampling emissions from fabric filters are considered, and several testing procedures discussed. Quite often, because of the properties of the emissions, special care must be exercised in operating the selected test equipment. Nevertheless, except to determine operating efficiency, sampling for performance of fabric filters needs to be carried out only at the baghouse outlet. While equipment handling and performance problems are common, they are also usually easy to recognize. Difficulties associated with the certification of control equipment may not be resolved readily, however, unless the information obtained is not only complete, but also transmitted effectively to the proper authorities. National emission standards are reviewed, and emission levels expected to produce visually clear plumes (excepting condensed moisture plume) produced at various sources using electrostatic precipitators and fabric filters or wet scrubbers are listed. (Author abstract modified)

44421

APTIC NO. 67427

Braman, R. S., D. L. Johnson, and C. C. Foreback

ANALYTICAL STUDIES OF THE SPECIATION OF MERCURY, ARSENIC, AND ANTIMONY. National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 359-378. 7 refs. (Aug. 8-10.)

NTIS: CONF-730802

The selective absorption by sampling tubes combined with the high detection sensitivity of the d.c. discharge detector permits the determination of various forms of mercury when present at ambient levels in the air. A d.c. discharge detector system used with a helium carrier gas has a limit of detection near 0.01 nanograms for Hg, thus permitting the analysis of 3-100 ng Hg/cu M in 30-100 l air samples. Selective determination of metallic Hg, dimethyl mercury, methyl mercury(II) compounds, and less-volatile Hg compounds such as mercury chloride is achieved using a five-section sampling tube system. Particulate mercury is filtered out on a glass filter; mercury chloride and methyl mercury(II) compounds are absorbed onto specially treated Chromasorb-W columns. Metallic Hg passes through and is absorbed onto silver coated glass beads. Dimethyl mercury passes through both of the prior columns and is quantitatively held by gold-coated glass beads. Absorbed Hg and compounds are desorbed and passed into the detector by heating. Water samples may also be analyzed for mercury compounds. Limits of detection are near 0.01 ppb. Analytical methods are discussed to determine various arsenic compounds in aqueous solutions. Based upon reduction to arsenic and detection in a direct current discharge emission detection system, the methods are capable of fractional nanogram limits of detection. Sample sizes up to 50 ml are conveniently processed giving concentration limits of detection approximately 0.02 ppb for each of the arsenic chemical forms. Antimony analyses are done in a similar manner. Utilizing the technique in the analysis of a variety of natural water and other types of samples, significant amounts of methyl arsenic acids have been found in lake water, sea shells, and river water. Human urine samples can contain more arsenic in

methylated forms than in inorganic forms. These findings confirm the suspected biological methylation of arsenic. (Author abstract modified)

44422

APTIC NO. 67430

Carter, J. A., R. L. Walker, D. R. Matthews, and J. R. Walton. MEASUREMENTS OF NITROGEN AND NITROGEN ISOTOPIC RATIOS USING REDUCTION PYROLYSIS COUPLED WITH MASS SPECTROMETRY. *National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 448-457. (Aug. 8-10.)*

NTIS: CONF-730802

An analytical system for measuring total nitrogen and its isotopic abundance in a variety of environmental samples was developed. A reductive pyrolysis system and a directional focusing 6-inch gas mass spectrometer were combined into the analytical system. In the reductive part of the system, nitrogen species were converted to ammonia with an atmosphere of hydrogen in the presence of a heated nickel catalyst. Five percent of the gas stream was split away for measuring total nitrogen by a conductivity detector. The ammonia was removed from the gas stream employing a cold finger reaction vessel. The hydrogen-free ammonia was decomposed thermally to nitrogen and hydrogen at 1000 C, employing a hot platinum filament. The N₂ produced from the decomposition was used for measuring the abundance of masses 28 and 29 by mass spectrometry. From this ratio, the N(15) atom fraction was calculated. Standard samples of N₂, ammonia, orchard leaves, and urea were successfully analyzed to determine isotopic compositions. Samples containing as little as 20 micrograms of total N₂ could be analyzed by the system. By the addition of multi-reaction vessels, three samples could be completed per hour. (Author abstract)

44423

APTIC NO. 67462

Goldstein, H. W., M. H. Bortner, R. N. Grenda, A. M. Karger, and P. J. LeBel

CORRELATION INTERFEROMETRIC MEASUREMENT OF TRACE SPECIES IN THE ATMOSPHERE.

Preprint, American Inst. of Aeronautics and Astronautics, New York and American Meteorological Society, 10p., 1973. 8 refs. (Presented at the American Institute of Aeronautics and Astronautics/American Meteorological Society International Conference on the Environmental Impact of Aerospace Operations in the High Atmosphere, Denver, Colo., June 11-13, 1973, Paper 73-515.)

Two correlation interferometers, a breadboard model and an engineering model, were designed, constructed, and tested for the measurement of selected atmospheric trace species. Test results showed that errors of less than 10% are attainable for atmospheric amounts of carbon monoxide and methane measured at 2.3 micron. Based on these results, a program was undertaken to determine the feasibility of measuring other trace species by correlation interferometry. In addition to CO and CH₄, carbon dioxide, water vapor, ammonia, nitric oxide, nitrous oxide, nitrogen dioxide, and sulfur dioxide can also be accurately measured with this instrument. (Author abstract modified)

44424

APTIC NO. 67419

Gordon, G. E., E. S. Gladney, J. M. Ondov, T. Conry, and W. H. Zoller

PROBLEMS WITH THE USE OF CASCADE IMPACTORS. *National Science Foundation-Research Applied to National Needs, Washington, D. C., Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 138-145. 5 refs. (Aug. 8-10.)*

NTIS: CONF-730802

Cascade impactors can be used to collect atmospheric particles so that size fractions can be determined. Considerable care must be taken in the use of cascade impactors because of experimental artifacts that can distort the size distributions, especially wall losses and particle bounce-off, the latter followed by reentrainment and deposition of the particles on later stages of the impactor. Side-by-side comparisons were made of three types of impactors in common use in particulate studies: the Lundgren and Scientific Advances impactors and a modified Andersen sampler. The Scientific Advances impactor gave the highest collection efficiencies and the least amount of bounce-off. The modified Andersen produced slightly more distortion, and the Lundgren exhibited serious bounce-off effects, especially for particles bearing aluminum. (Author abstract modified)

44425

APTIC NO. 67500

Goulding, F. S. and J. M. Jaklevic

PHOTON-EXCITED ENERGY-DISPERSIVE X-RAY FLUORESCENCE ANALYSIS FOR TRACE ELEMENTS. *Ann. Rev. Nucl. Sci., vol. 23:45-74, 1973. 32 refs.*

The use of photon-excited energy-dispersive X-ray fluorescence for the analysis of trace elements is reviewed. Topics covered include: physical mechanisms involving the production of characteristic spectral lines, scattering processes, background-producing processes, and detection sensitivity; calibration considerations; and spectrometer design aspects involving the primary radiation source, the electronic system, energy resolution, and counting-rate performance. Analytical results for an airborne particulate sample are tabulated by element for lead, iron, calcium, bromine, chlorine, titanium, vanadium, chromium, manganese, nickel, zinc, and copper. Sensitivities of less than 5 ng for most elements per sq cm of filter are obtainable with the method.

44426

APTIC NO. 67473

Guglya, V. G., and V. Y. Shepelev

PYROELECTRIC MATERIALS USED FOR ANALYZING SMALL CONCENTRATIONS OF CARBON MONOXIDE. (*Primeneniye piroelektricheskikh materialov dlya tseley analiza malykh kontsentratsiy okisi ugleroda*). Text in Russian. *Izv. Vysshikh. Uchebn. Zavedenii Chernaya Met., no. 7:179-181, 1973. 2 refs.* (Translation available from British Industrial and Scientific International Translation Service, 1 Carlton House Terrace, London SW1Y 5DB, England, AS BISI 11897.)

The use of pyroelectric materials for the highly sensitive determination of carbon monoxide is described. The CO concentration can be recorded using pyroelectric substances either by the catalytic reaction of CO with oxygen at the surface of a sensitive element (lithium niobate monocrystals) coated with a catalyst layer, or by measuring changes in the thermal conductivity, for which lead titanate-zirconate is used as a sensitive element. Pyroelectric detectors were suitable for the detection of CO concentrations as low as 0.0001-0.00001% by volume.

44427

APTIC NO. 67528

Habel, Karl

PRESENT STATE OF THE MEASURING TECHNIQUE FOR THE DETERMINATION OF THE FLUORINE CONTENT IN IMMISSIONS AND EMISSIONS. (*Derzeitiger Stand der Messtechnik zur Bestimmung des Fluorgehaltes in Immissionen und Emissionen*). Text in German. *Arch. Eisenhuettenw., 44(9):6p., Sept. 1973. 7 refs.*

The present state of measuring techniques for the determination of the fluorine content in immissions and emissions is reviewed. Topics covered include: the calculation of the characteristic immission data, comparison of different immission measuring procedures, problems in the separation of gase-

MEASUREMENT METHODS

44433

ous and solid fluorine compounds in immersion and emission measurements, and the assessment of test results. Although a reliable procedure for the exact separation of gaseous and solid fluorine compounds is not yet available, a solution appears possible if binding definitions for the limitation between gaseous and solid fluorine compounds are given and accepted. A procedure is possible for emission measurements enabling the determination of gaseous fluorine compounds with an exactness of 10-15%; solid fluorine compounds can be determined on the basis of an exact determination of dust.

44438

APTIC No. 67867

McClendon, Lottis T.

SELECTIVE DETERMINATION OF CHROMIUM IN BIOLOGICAL AND ENVIRONMENTAL MATRICES.

Preprint, National Bureau of Standards, Washington, D. C., Analytical Chemistry Div., 11p., 1973 (7). 10 refs.

Chromium occurs in many biological and environmental materials, but only in trace amounts, which makes determination by the usual chemical methods very difficult and sometimes impossible. Destructive neutron activation analysis, utilizing the reaction $^{50}\text{Cr}(\text{n}, \gamma)^{51}\text{Cr}$ can eliminate many of the difficulties encountered with other techniques. A detailed description of chromium determination in various biological (for example, liver, leaves, and urine) and environmental (for example, coal and fly ash) samples using the NBS Reactor, coupled with a very selective radiochemical separation procedure, is discussed. (Author abstract)

44439

APTIC No. 67821

McFarland, A. R., H. S. Nye, and C. H. Erickson

DEVELOPMENT OF A LOW PRESSURE IMPACTOR.

Anderson 2000 Inc., Atlanta, Ga., Environmental Protection Agency Contract 68-02-0363, Program Element 1A1010, Rept. EPA-650/2-74-014, 35p., Oct. 1973. 20 refs.

NTIS: PB 237417/AS

The design, fabrication, and testing of a low pressure impactor aerosol sampler are described. The system injects a fixed aerosol flow rate of 1 cfm at inlet conditions and causes the particulate matter to be separated and collected on four atmospheric pressure and three reduced pressure impaction stages and an after-filter. Cutpoint sizes of the stages are 9.7, 5.0, 2.46, 1.21, 0.355, 0.141, and 0.05 micron for spherical particles with a density of 2 g/cc. Each of the impaction stages is fitted with a glass fiber media collection substrate to facilitate gravimetric analysis of the collected samples. Experiments conducted with laboratory aerosols show the system to have wall losses less than 6% when the mass median diameter of the aerosol is 0.6 micron. Wall losses on the upper stages are less than 11% for particles 6.1 micron in size. Both particle rebound and reentrainment from the collection surfaces are negligible. Each low pressure stage can be loaded with more than 10 mg of deposited aerosol without reentrainment occurring. (Author abstract modified)

44439

APTIC No. 67793

Mueller, P. K., Y. Tokiwa, E. R. de Vera, W. J. Wehrmeister, T. Belski, S. Twiss, and M. Imada

A GUIDE FOR THE EVALUATION OF ATMOSPHERIC ANALYZERS.

California State Dept. of Health, Berkeley, Air and Industrial Hygiene Lab., Lab. Program, Environmental Protection Agency Contract 68-02-0214, EPA-650/4-74-014, 248p., June 1973. 49 refs.

NTIS: PB 233048/AS

A guide for the selection, application, and evaluation of atmospheric analyzers is presented. The guide, which is designed for use by operating personnel, provides definitions for selected terms commonly used in the description of air monitoring practices and instrumentation; lists specific physical and performance characteristics for which information is routinely needed; recommends the format and information to be included in instrument operating instructions; describes test

procedures for evaluating physical and performance characteristics of automated analyzers for atmospheric monitoring; and provides procedures for the calibration of atmospheric analyzers for carbon monoxide, nitric oxide, nitrogen dioxide, ozone, oxidant, and sulfur dioxide.

44431

APTIC No. 67753

Reiss, Nathan and Richard M. Schotland

A STUDY OF THE FEASIBILITY OF REMOTE MEASUREMENT OF ATMOSPHERIC DENSITY AND TURBIDITY BY MEANS OF ROTATIONAL RAMAN SCATTERING OF LASER LIGHT (FINAL REPORT).

New York Univ., University Heights, Dept. of Meteorology and Oceanography, National Aeronautics and Space Administration Contract NAS-21666, NASA-CR-132816, 200p., July 1973. 59 refs.

NTIS: N74-10500

A remote sensing technique is described which utilizes elastic scattering and rotational Raman scattering of laser light in the atmosphere to obtain soundings of turbidity, transmissivity, and density. When irradiated by monochromatic light, both molecular and particulate components of the atmosphere scatter light at the incident frequency. The gaseous component produces a temperature dependent pure rotational Raman spectrum which extends about 200/cm above and below the incident frequency. Scattering from nitrogen and oxygen is greater than that from particulates and minor atmospheric constituents. A scheme is devised to eliminate the effects of atmospheric temperature structure. The close spectral proximity of the elastic and Raman scattered signals, combined with the fact that the Raman scattering is quite weak, produces special requirements for the spectroscopic and light gathering components of a rotational Raman laser radar (lidar) system. A computation of typical signal to noise ratios is made. (Author abstract modified)

44432

APTIC No. 67477

Sherma, Joseph and Talaat M. Shafik

A MULTICLASS, MULTIRESIDUE ANALYTICAL METHOD FOR DETERMINING PESTICIDE RESIDUES IN AIR.

Preprint, American Chemical Society, Washington, D. C., 33p., Aug. 10, 1973. 22 refs. (Presented at American Chemical Society, National Meeting, 164th, New York, Aug. 27, 1972.)

A multiresidue method for determining chlorinated organophosphate, and N-methyl carbamate insecticides was developed for use in the National Air Monitoring Program. The method involves partitioning and extracting the pesticides from the ethylene glycol trapping solvent with methylene chloride followed by fractionation and cleanup by elution through a silica gel column. The chlorinated compounds are determined by electron capture gas chromatography (GC), phosphate compounds by flame photometric GC, and carbamates by electron capture GC after derivatization with pentafluoropropionic anhydride. Recovery data and limits of detectability are presented for 11 chlorinated, 7 phosphate, and 7 carbamate pesticides at high and low levels. The method is applicable to other compounds not successfully determined by the present analytical procedure. The method may be adaptable for the analysis of pesticide residues in foods and other environmental samples. (Author abstract modified)

44433

APTIC No. 67819

Smith, Franklin and A. Carl Nelson, Jr.

GUIDELINES FOR DEVELOPMENT OF A QUALITY ASSURANCE PROGRAM. MEASURING POLLUTANTS FOR WHICH NATIONAL AMBIENT AIR QUALITY STANDARDS HAVE BEEN PROMULGATED (FINAL REPORT).

Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-0398, ROAP No. 26BGC, Program Element 1HA327, Rept. EPA-84-73-028-e, 174p., Aug. 1973. 30 refs.

NTIS: PB 237351/AS

Guidelines for measurement of pollutants for which National Ambient Air Quality Standards have been promulgated are presented along with background information directly applicable to the Management Manual sections of field documents written for each method. Pollutants and methods of sampling and analysis covered include: sulfur dioxide (spectrophotometric pararosaniline method), photochemical oxidants as ozone (chemiluminescence), suspended particulates (high-volume method), nitrogen dioxide (chemiluminescence), and carbon monoxide (non-dispersive infrared). Topics covered under background information for field documents include: the selection of auditing schemes, cost implications, and data quality assessment. Appendices are provided for computer simulation, sensitivity analysis, frequency distributions, estimation of the mean and variance of various comparisons of interest, and control charts.

44434

APTIC NO. 67594

Suzuki, Shin and Nobutoshi Horiuchi

A RESTUDY OF ANALYSIS OF FORMALDEHYDE BY MEANS OF PARAROSANILINE. (*Pararosanirin-ho ni yoru horumu arudehido bensekiho no saikento*). Text in Japanese. Chiba Daigaku Kankyo Kagaku Kenkyu Hokoku (*Environ. Sci. Res. Rep., Chiba Univ.*), 1(1):99-102, July 1973. 1 ref.

The pararosaniline method is recommended for measurement of formaldehyde. Since it is affected by a heating operation, a cooling operation and methods to preserve reagent solutions are presented. The effect of the heating operation on the degree of absorption is such that absorption increases with an increase in temperature, then decreases again, giving a peak. The maximum degree of absorption was recorded at 30°C in 35 min. This method is not stable since fading occurs swiftly. Cooling operations were conducted by using water at different temperatures and by changing the cooling time. The degree of absorption decreased and reached a stable point in 5 min. The degree of absorption generally shows a low value in proportion to the cooling temperature.

44435

APTIC NO. 67428

Talmi, Y. and R. E. Mesmer

GAS CHROMATOGRAPHY/MICROWAVE EMISSION SPECTROSCOPY FOR MEASURING VOLATILE ORGANOMETALLICS. *National Science Foundation—Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 381-396. 18 refs. (Aug. 8-10.)*

NTIS: CONF-730802

Gas chromatography with the very sensitive microwave emission spectrometric detector was used to study the distribution of dimethyl mercury between air and water and the vapor pressures above methyl mercury compounds and their solutions. The distribution coefficient for $(CH_3)_2Hg$ was 0.31 at 25°C and 0.15 at 0°C which shows that this compound will be readily lost to the atmosphere above natural water bodies. The vapor pressures of methyl mercury chloride(s) and methyl mercury hydroxide(s) were 11 and 5.6 micron of Hg respectively at 22°C. The volatility of pH can be interpreted in terms of the known equilibria occurring in the water phase. Very rapid photochemically catalyzed reactions of methyl mercury compounds with iodine or bromine at very low concentrations were discovered in water at room temperature. Such reactions offer a potential means for the destruction of methyl mercury compounds from laboratory or industrial discharges. In addition, the reaction with I₂ is an important potential source of error in analytical procedures utilizing the high extractability of the methyl mercury iodide species. The reaction produces methyl iodide and mercury iodide(s) and is first-order in the concentrations of both the CH_3HgCl and I₂. (Author abstract)

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44436

APTIC NO. 67689

Kanagawa Prefectural Pollution Control Center

METHODS OF DETERMINATION OF TRACE SULFURIC ACID ION IN THE AIR AND WATER. (*Taikichu oyobi suichu no hiroyo ryusan ion teiryoho no kento*). Text in Japanese. Kanagawa-ken Taiki Osen Chosa Kenkyu Hokoku (*Tech. Rept., Air Pollution Yokohama-Kawasaki Ind. Area*), no. 15:236-239, Feb. 1973.

The dinitrosulfonazo III method was examined in search of a better colorimetric determination of minute amounts of sulfate ion in atmospheric pollutants and in water. This method is based on fading color, but has sensitivity 50 times that of the chloranil method. For samples taken from rivers, water mains, and industrial waste water, the analytical limit is 2.15 ppm. For atmospheric samples, where the air volume is 20 liters, the limit is 0.125 ppm. The liquid color is very stable, and the procedures are simple and convenient. There is hardly any influence from positive ions when positive ion exchange resins are used in treatment. The negative ions present during the experiments did not affect the results. The hydrogen peroxide solution which was used to absorb atmospheric samples did not affect the results. The quantitative results agreed well with results obtained by the barium chloranilate method.

44437

APTIC NO. 67610

Kanagawa Prefectural Pollution Control Center

COLORIMETRY QUANTITATION OF PYRIDINE IN FLUE GASES. (*Haigasu chu no pirijin no hisyoku teiryoho*). Text in Japanese. Kanagawa-ken Taiki Osen Chosa Kenkyu Hokoku (*Tech. Rept. Air Pollution Yokohama-Kawasaki Ind. Area*), no. 15:240-243, Feb. 1973.

The amount of pyridine in exhaust gases was determined colorimetrically by a modification of the pyridine-pyrazolone method for quantitative determination of cyanogen. Pyridine was collected in 0.1 N sulfuric acid, to which cyanogen solution was added. After neutralization with sodium hydroxide, and further treatment with phosphate buffer solution (pH 6.8), chloramine-T solution, and pyrazolone solution, a blue compound with an absorption maximum near 620 millimicrons was formed. The presence of nitrogen dioxide and ammonia did not affect the analysis, but the presence of sulfur dioxide and $(CH_3)_3N$ did. By passage through NaOH, SO₂ was removed, but there was no good method for counteracting the effects of $(CH_3)_3N$. By passing pyridine exhaust gas through 0.1 N H₂SO₄, over 98% of the pyridine was removed. Pyridine concentrations were determined from a low of 0.01 ppm to a high of 15 ppm in the test plant measurements for exhaust gas treatment.

1972

44438

APTIC NO. 67472

Bertolaccini, Pier Luigi

SPECTROPHOTOMETRIC TECHNIQUES IN AIR POLLUTANT ANALYSIS. (*Tecniche spettrofotometriche nell'analisi di inquinanti atmosferici*). Text in Italian. *Boll. Lab. Chim. Prov.*, 23(4):336-351, July-Aug. 1972. 35 refs.

The applications of infrared, visible ultraviolet, atomic absorption, spectrophotometry, and fluorimetry spectrophotometry to the determination, identification and detection of diverse air pollutants are surveyed. Infrared spectrophotometry is suitable for the detection of such gases as ozone, carbon monoxide, carbon dioxide, sulfur dioxide, hydrogen sulfide, nitrous oxide, nitrogen dioxide, methane, ethane, acetylene, benzene, methanol, carbon tetrachloride, and hydrochloric acid. Its sensitivity usually ranges from 0.01 to 1 ppm for most gases. The spectrophotofluorimetry has the advantages of highly increased sensitivity and high discrimination power. The combination of gas chromatography or thin-layer chromatography with spectrophotofluorimetry is especially suitable for the determination of polycyclic aromatic hydrocarbons. Its sensitivity amounts to 0.9 nanograms for fluorene, 10 nanograms

for anthracene, 9 nanograms for chrysene, 0.7 nanograms for 3,4-benzopyrene, and 1 nanogram for 11,14-benzofluoranthene. Neutron activation analysis, emission spectrography, and especially atomic absorption spectrophotometry are used for the determination of metals, such as arsenic, barium, calcium, cadmium, chromium, copper, iron, manganese, nickel, lead, vanadium, and zinc in atmospheric dust.

44439

APTIC NO. 67516

Ng, D. Y. C., R. H. Elkins, and R. B. Rosenberg

A REEVALUATION OF THE CURRENT JACOBS-HOCHHEISER PROCEDURES IN LABORATORY AND FIELD USE. Preprint, Inst. of Gas Technology, Chicago, Ill., Sp. 1972.

Laboratory calibration of the Jacobs-Hochheiser (J-H) method indicates that the nitrogen oxide collection efficiency is not a constant 35% as indicated by the Environmental Protection Agency, but instead varies with nitrogen dioxide concentration. Furthermore, comparative studies indicated that the J-H procedure, specified by EPA as the reference method for the National NO₂ Ambient Air Quality Standard, gives different results from the J-H procedure actually used in the Chattanooga NO₂ health effect study upon which the National NO₂ Ambient Air Quality Standard was based. (Author abstract)

44440

APTIC NO. 67649

Nose, Yoshikatsu

PROBLEMS AND REVIEWS OF AIR POLLUTION INSPECTION. (Taiki oson kanshi no mondaiten to tenbo).

Text in Japanese. Yamaguchi Sangyo Igaku Nenpo (Ann. Rept. Soc. Yamaguchi Ind. Health), no. 19:51-56, March 1972.

In most areas, only one of the three popular methods of pollutant monitoring is used: the cumulative measurement by the month; instant concentration measurement; and automatic continuous recording. The first is easy to execute and shows geographical differences, time changes of pollution conditions, and is used in many smaller cities; but the measurement cycle covers a long time and does not help analysis of pollution mechanism or countermeasures. Automatic recording allows only temporary prevention measures when conditions worsen, but does not show the large area pollutant behavior and complex compositions. Therefore, while automatic continuous measurements of sulfur oxides, suspended particulates, nitrogen oxides, carbon monoxide, and hydrocarbons should be taken, cumulative measurements of these pollutants should be taken by deposit gauges, lead dioxide candles, and filter paper. In Yamaguchi Prefecture, emergency countermeasures are given when SO_x concentration rises above a certain level for a continuous period; factories are either advised or requested, depending on the state of pollution, to reduce the amount of smoke emission. These methods of control are all temporary. More lasting and complete measures should be taken based on the information as to where, when, who, what, and why of pollution conditions; by comprehensive studies of these factors, one is able to determine whether a phenomenon of high pollution is caused by faulty operations of industries, whether the equipment is faulty, or if certain meteorological factors are to blame.

44441

APTIC NO. 65773

Sasuge, Hiroo and Toshihiro Nakamura

A STUDY OF THE ANALYTICAL METHODS APPLIED TO POLLUTION MEASUREMENTS. (Kogi seibun no bunseki hoho no kankyū). Text in Japanese. Meiji Daigaku Kagaku Gijyutsu Kenkyusho Nenpo (Ann. Rep. Inst. Sci. Technol., Meiji Univ.), no. 14:9-10, 1972.

The chemical composition of settling particles differ depending on the sampling location, and the preparation of standard dusts is difficult. If the test material is made into a solution, the matrix effect problem is solved and the chemical quality

becomes even; the preparation of standard dusts becomes easier. But the concentration tends to be lower in the liquid form than the solid form, and analysis of trace material is difficult. Methods for simultaneous settling separation, catalytic extraction, and ion exchange separation were compared. Bromine quantitation was tested by these three methods. The results of the first and third method were closer; the second was quite different. Suspended particulates were captured on a membrane filter and the dusts were examined by an X-ray refractor. Quartz, calcium sulfate, and clay minerals were recognized. The effects of coexisting elements on quantitation and the effects of matrix must be further studied.

44442

APTIC NO. 67921

Sinclair, David

A PORTABLE DIFFUSION BATTERY. ITS APPLICATION TO MEASURING AEROSOL SIZE CHARACTERISTICS. Am. Ind. Hyg. Assoc. J., 1972:729-735, Nov. 1972. 13 refs.

A miniature portable cluster-tube diffusion battery for measurement of the size and size distribution of submicron aerosols (1-100 nm) is described. A series of commercially available Collimated Holes Structures are mounted in sleeves with O-rings so that aerosol penetration can be measured at a number of outlets along the series. The CHS are stainless-steel discs of several different diameters and thicknesses, containing a large number of nearly circular holes. The actual length of the apparatus is about 2 ft but the equivalent length is 3.25 m. Calculated curves of penetration versus particle size are used to evaluate size distribution and show that the equivalent size frequently reported from one measurement with a rectangular diffusion battery is practically meaningless. The value depends as much on the characteristics and mode of the operation of the diffusion battery as on the aerosol; the longer the battery and the lower the air flow, the greater the equivalent size will appear to be. Graphical plots of the cumulative size distribution of room aerosol and silver aerosol are illustrated for large battery and miniature battery measurements and appear to be in close agreement. Measurements on radon daughters in uranium mines with the miniature batteries show activity median diameters from 0.1 to 0.17 micron, with standard deviations from 2 to 4. Two similar measurements made in the laboratory on room air tagged with about 50 pCi/l radon daughters show activity median diameters of 0.15 and 0.17 micron, with geometric standard deviations of 2.2 and 2.6, respectively.

1971

44443

APTIC NO. 67485

Lahne, H., M. Kliemt, and G. Franke

PROCESS FOR THE CONTINUOUS SEPARATION OF RESPIRABLE DUST PARTICLES FROM AEROSOLS.

(Verfahren zur kontinuierlichen Abscheidung lungengängiger Staubteilchen aus Aerosolen). Text in German. Maschinenbau, 20(5):219-221, 1971. 1 ref.

A new aerosol sampler for the continuous or semicontinuous selective sampling of respirable particles not larger than 8 microns is described. The sampler can operate continuously for 1 to 2 wk, or semicontinuously with automatic operation control for up to 2-8 wk. The air flow through the filter FFP-5 filter tissue can be varied from zero to 90 l/hr, and the flow rate can be varied between zero and 1.3 cm/sec corresponding to a particle size range of 0-12 micron. The sampler can be connected to mains, and be used optionally as a portable or stationary device. The dust samples collected can be analyzed by gravimetric method.

44444

APTIC NO. 67542

Schager, Margaret

DETECTION OF VEHICLE EXHAUST/PETROLEUM VAPORS. Franklin Inst. Research Labs., Philadelphia,

Pa., Army Contract DAAD05-68-C- 0283, Task 05-PA-70, Rept. LWL/CR-05PA70, 20p., March 1971. 8 refs.

NTIS, DDC: AD 773717

Results are reported from a literature search and investigation to determine trace quantities of vehicle exhaust products (including fuel additives) present in the atmosphere near vehicles and hydrocarbon and petroleum vapors from any source, as well as techniques and commercially available equipment for the detection of such air pollutants. Various industrial and nonindustrial sources as well as mobile sources are listed according to the following pollutants generated: nitrogen dioxide, sulfur dioxide, carbon monoxide, aldehydes, hydrocarbons, paraffins, olefins, aromatics, and acetylene. Pollutants are also listed according to the following analytical techniques: wet chemical, mass spectrometry, infrared techniques, gas chromatography, and flame ionization. Various commercial analyzers are listed for CO, SO₂, NO₂, and hydrocarbons.

1970

44445

APTIC NO. 67751

Filatova, A. S., A. I. Kuz'minykh, and F. D. Veretnikov

THIN-LAYER CHROMATOGRAPHIC ANALYSIS OF TAR PRODUCTS. (*O primeneni tonkosloynoy khromatografii dlya analiza smolistykh produktov*). Text in Russian. *Gigiena Truda i Prof. Zabolevaniya*, no. 14: 47-49, June 1970. 2 refs.

A combined fluorescent and thin-layer chromatographic method for the detection and identification of polycyclic aromatic hydrocarbons present in the neutral fraction of tar products released into the air during the sublimation of the anode body during aluminum electrolysis is described. Activated alumina was used as a sorbent, and the neutral fraction of the sampled tar products was dissolved in sulfur ether. The fluorescent spots obtained on the sorbent in UV light were reextracted with chloroform, transferred into n-hexane and identified by fluorescence spectral analysis at the temperature of liquid nitrogen. Perylene, 3,4-benzopyrene, and 1,2-benzanthracene were identified in the tar products released into the air during the sublimation of the anode. The thin-layer chromatographic method was more sensitive than the paper-chromatographic technique.

44446

APTIC NO. 67545

Karolinska Inst., Stockholm (Sweden), Dept. of Environmental Hygiene

METHODS FOR MEASURING AND EVALUATING ODOROUS AIR POLLUTANTS AT THE SOURCE AND IN THE AMBIENT AIR. REPORT OF AN INTERNATIONAL SYMPOSIUM IN STOCKHOLM, JUNE 1-5, 1970. 77p., 1970. 125 refs.

The papers and discussions presented at a symposium on methods for measuring and evaluating odorous air pollutants are summarized. Odors and air quality criteria and standards are discussed. Source measurement, sampling, physicochemical methods, sensory methods, detection methods, odor sources, effects on humans, and socio-economic effects are described.

1967

44447

APTIC NO. 67733

Gronsborg, Y. S.

DETERMINATION OF ALLYL ALCOHOL AND ACRYLIC AND METACRYLIC ACIDS IN THE AIR.

(*Opredeleniye allylovogo spirta, akrilovoy i metakrilovoy kislot v vozdukh*). Text in Russian. *Khim. Prom. (Moscow)*, no. 7:513-514, 1967.

A sensitive method for the determination of allyl alcohol, acrylic, and metacrylic acids in the air, based on their oxida-

tion by permanganate and iodine compounds, is described. Air is sampled through Petri absorbers with 2% ammonium acetate solution at a rate of 20 l/hr, which the sample is combined with permanganate, potassium iodide, or iodic acid as well as sulfuric acid and chromotropic acid. The violet color obtained by oxidation to formaldehyde is stable for 2-3 days, and can be measured against standard solution or colorimetrically at 574 nanometers.

AIR QUALITY MEASUREMENTS

1974

44448

APTIC NO. 67595

Benvenuti, F., C. Conte, and G. Devitofrancesco

MEASUREMENT OF THE AIR POLLUTANT CONCENTRATION RATIOS FOR DIFFERENT ALTITUDES OVER A LARGE URBAN AGGLOMERATION. (*Misure dei rapporti delle concentrazioni di alcuni inquinanti a differente altezza su un grande agglomerato urbano*). Text in Italian. *Inquinamento*, 16(4):15-18, April 1974. 9 refs.

The correlations between the concentrations of sulfur dioxide, and sulfates, as well as nitrogen dioxide and nitric oxide were studied by simultaneous concentration measurements at 2 pm and 8 pm at ground level and at 400 m by means of a balloon. The range of the variation of the SO₂ concentrations was 50% at 400 m against 20% at ground level. The sulfate-SO₂ ratios were consistently higher at 400 m than they were at ground level, and so was the range of variation of this ratio at altitude. Considerable influence of the humidity, solar radiation, and ozone on the sulfate-SO₂ ratio was established. This ratio was highest at 2 pm at 400 m, while the ratios established at 2 pm and 8 pm at ground level were largely of the same order of magnitude. The NO concentration peaked between 5 and 9 pm, and the NO₂ concentration was highest at 400 m altitude at 8 pm and lowest at ground level.

44449

APTIC NO. 67606

Bredel, H., M. Rehwagen, and C. Stamm

DETERMINATION OF THE AEROSOL, LEAD, SOOT AND SULPHUR DIOXIDE CONCENTRATION OF THE AIR IN THE CITY CENTER OF LEIPZIG. (*Bestimmung des Schwebstaub-, Blei-, Russ- und Schwefeldioxidgehaltes der Luft im Stadtzentrum von Leipzig*). Text in German. *Z. ges. Hygiene Ihre Grenzgebiete (Berlin)*, 20(8):472-479, 1974. 27 refs.

From February 1972 to March 1973 airborne dust, soot, lead, and sulfur dioxide were measured in the center of Leipzig. There were great differences between the mean values in the firing period and those in the non-firing period for dust, soot, and SO₂ (but not for lead). The lawful long-term limiting value is exceeded by a high percentage of the measured values. Correlation and regression analyses show significant positive correlations between the contaminating components. Apparently a considerable amount of solid particles will reach the atmosphere even if deposited temporarily on the ground. The annual average concentrations were 0.35 mg/cu m for SO₂ (average for the heating season 0.44 mg/cu m, for the summer season 0.24 mg/cu m), 0.19 mg/cu m for dust (0.24 and 0.13 mg/cu m), 31.5 micrograms/cu m for soot (42.8 and 22.4 micrograms/cu m) and 0.40 micrograms/cu m for lead (0.42 and 0.37 micrograms/cu m).

44450

APTIC NO. 67914

Gilmore, Timothy M. and Thomas R. Hanna

REGIONAL MONITORING OF AMBIENT AIR CARBON MONOXIDE IN FAIRBANKS, ALASKA. *J. Air Pollution Control Assoc.*, 24(11):1077-1079, Nov. 1974. 7 refs.

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A method employing the timed fill of Mylar bags was used to obtain average carbon monoxide concentration values for 10 locations in the Fairbanks, Alaska, area. The method was accurate, reliable, and inexpensive. The correlation coefficient between the bag sampling method and a continuous CO analyzer was 0.945; correlation of CO data from several locations to a reference in downtown Fairbanks showed a general decrease with distance from the reference analyzer. Analysis of data from Fairbanks showed that CO concentrations during the winter months may have to be reduced by 50-75% to achieve the State and National Ambient Air Quality Standards; the high levels of CO were the result of emissions from automobile traffic during periods of severe inversion in the Fairbanks basin. (Author abstract)

44451

APTIC NO. 63904

Ito, Nobuo, Kinji Nakano, Akio Izumikawa, Tomio Hirono, Masanao Funashima, Kunihiro Asakuno, Yoshiko Kobayashi, Masataka Sofuku, Hisaji Yokota, and Toshio Odaira

NONMETHANE HYDROCARBONS AND HYDROCARBON COMPOSITIONS. (*Himetan tanka suiso to tanka suiso sosei ni tsuite*). Text in Japanese. In: *Studies on Tokyo Smog*. Tokyo Metropolitan Research Inst. for Environmental Protection (Japan), Rept. 3, p. 307-322, March 1974. 4 refs.

Hydrocarbon composition, its regional difference, and the relationship between nonmethane HC and ozone were investigated. The average methane concentrations measured at nine locations during 1972 and 1973 were in the range of 1.24-1.9 ppm, and the nonmethane HC concentrations measured between 6-9 am were in the range of 0.34-0.95 ppm, indicating that more than 1/2 of atmospheric HC is CH₄. The nonmethane HC determined by the oxidant supremum value is 0.23 ppmC at 0.1 ppm oxidant/day max, and 1.23 ppmC at the oxidant alarm standard of 0.15/day max. For the evaluation of maximum day concentration of oxidant based on the relationship between nonmethane HC and nitrogen oxides, the data obtained were insufficient. The atmospheric HC compositions measured at 10 locations were generally analogous to those of automotive exhaust gas. The contributory rates of unsaturated HC and aromatic HC to the oxidation of nitric oxide to nitrogen dioxide were 41% and 42%, respectively. The contributory rates of unsaturated HC and aromatic HC to eye irritation were 20% and 80%, respectively.

44452

APTIC NO. 67553

Iwamoto, Yoshitora and Tadashi Yamasaki

SULFUR DIOXIDE CONCENTRATION OF KARATSU.

(*Karatsu-shi arisan gasu nodo bunpu chose*). Text in Japanese. *Saga-ken Eisei Kenkyusho-ho* (Rep. Saga Prefect. Inst. Public Health), March 1974.

The Karatsu Thermal Power Plant No. 3 (capacity 500,000 kw) began its operation in July 1973. The automatic measurement of sulfur dioxide at the 10 monitoring stations of the area is scheduled to go on the telemeter system. As a preliminary investigation, the SO₂ concentration distribution was investigated. The measurements by the pararosaniline method and by the lead dioxide method were compared. By the rosaniline method, the average of November, December, and January was 0.0110 ppm which could not be considered serious pollution. The maximum figure was 0.0220 ppm at one location and the minimum was 0.0063 ppm at another. The PbO₂ method measurements agreed well. In this area, a high SO₂ concentration tends to occur in the morning because of several meteorological factors. The sea breeze front encroaches the area from the west at about 8:30 am every day. On November 25, when the concentrations was high, there was a low breeze of 2-3 m/sec and a strong ground inversion, which dispersed about 9:30 am.

44453

APTIC NO. 67951

Kojima, Hiroshi, Toshio Sekikawa, and Fumio Tanaka

ON THE VOLATILITY OF LARGE PARTICLES IN THE URBAN AND OCEANIC ATMOSPHERE. *J. Meteorol. Soc. (Japan)*, 52(1):90-92, Feb. 1974. 8 refs.

The volatility of large particles in urban and oceanic atmospheres was measured using a Royco particle counter for obtaining particle concentration and size distribution and standard particulate samples of ammonium sulfate or sodium chloride heated up to 340 C. The total concentration of particles from an urban sample was about 100,000/cu cm, with the concentration of particles larger than 0.15 micron (radius) being about 70/cu cm. The particle fraction between 0.2 and 1.0 micron accounted for nearly 20%, suggesting that most of these particles were volatile. Assuming that most of these particles were sulfate, the results agreed with previous reports that the chemical elements composing particles larger than 0.1 micron are (NH₄)₂SO₄ and sulfuric acid mist. Measurements over the North and South Pacific, where background concentrations of condensation nuclei from 300-400/cu cm existed, indicated at 95% fraction of particles remaining in regard to particles larger than 0.4 micron, suggesting that most particles were composed of nonvolatile materials such as NaCl.

44454

APTIC NO. 67927

Minegishi, Atsuko, Yoshiharu Shinozaki, and Hiroshi Morishima

PHOTOCHEMICAL SMOG AND ESR SPECTRA OF AIR DUST. (*Kokagu sumoggu to kukijin no denshi supin kyomei dyushu* (ESR) *tono sakan ni tsuite*). Text in Japanese. *Kogai* (Hakua Shobo) (Pollution Control), 9(4):23-35, July 1974. 13 refs.

Electron spin resonance spectrometry was used to analyze airborne dust sampled at the Setagaya Municipal Junior High School in Tokyo. The observed broad superposed singlet ESR spectra centered on g equal to 2.2, with wings spreading as wide as 5000 gauss and with a half width of about 5000 gauss. The spectra were neither saturated by microwave power up to 200 mW nor changed by a half year time lapse subsequent to sampling. Although heating of the dust samples at 100 C in a vacuum (0.0001 mm mercury) did not affect the spectra, spectral changes were observed at 200 C, with the spectral intensity diminishing by about one-half. The relative intensity of the ESR spectra correlated best with sulfur oxides and was beyond the expected value calculated from correlations involving photochemical smog-induced injury to humans. The main paramagnetic substances responsible for the ESR spectra of airborne dust samples are probably transition metal compounds.

44455

APTIC NO. 64372

Rumler, F., H. Neis, and R. Herbolzheimer

RESULTS OF MEASUREMENTS OF THE SULPHUR DIOXIDE LEVEL OVER THE PERIOD MAY 3 1972 TO APRIL 27, 1973 (FIFTH MEASUREMENT YEAR) IN THE AREA SAARBRUECKEN-VOELKLINGEN.

(*Ergebnisse der Schwefeldioxidpegelmessungen fuer die Zeit vom 3.5.1972 bis 27.4.1973 (5.Messjahr) im Raum Saarbruecken-Voelklingen*). Text in German. *Staatlichen Institut fuer Hygiene und Infektionskrankheiten Saarbruecken. Schriftenreihe herausgegeben vom Minister fuer Arbeit, Sozialordnung und Gesundheitswesen des Saarlandes*, (7):5-9, 1974.

The sulfur dioxide measurements in the area Saarbruecken-Voelklingen begun in 1967 were interrupted at the end of the fourth measurement year in April 1971 for one year and continued in May 1972. The measurements were taken at the same 122 points of the previous years. During the fifth measurement year 26 SO₂ measurements were taken at each station so that at the 122 measuring points a total of 3172 SO₂ measurements were taken. During the year 34 days with temperature inversion were counted, on 20 of which SO₂ measurements were

taken. The measurements are listed in tables. They revealed that the long-term and short-term ambient concentrations were not exceeded. The maximum long-term concentration measured was 0.11 mg SO₂/cu m air, the maximum short-term concentration 0.38 mg SO₂/cu m. The emission limits in the Technical Directives for the Conservation of Clean Air (Ta-Luft) are 0.40 (short-term) and 0.75 (long-term) mg SO₂/cu m.

44455

APTIC NO. 67505

Sugimae, Akiyoshi, Toshio Hasegawa, and Yasuhiro Matsuo

TRACE METALS IN AIRBORNE PARTICULATES. II. SURVEY OF IRON IN THE ATMOSPHERE. (*Ofusa fujinichu no kizoku seibun (da3-po) (tetsu ni yoru kizoku oson)*) Text in Japanese. *Taiki Oson Kenkyu* (Japan. Soc. Air Pollution), 9(1):5-12, Sept. 1974. 13 refs.

Atmospheric iron concentrations in commercial and residential areas of Osaka were measured every day except Saturday in October 1969 and February 1970 using high volume sampler and emission spectrographic analysis. The atmospheric Fe concentrations ranged from 0.31 to 42.6 micrograms/cu m. The median value of the log normal frequency distribution of the Fe concentrations was 6.8 micrograms/cu m, and the upper limit was 45.0 micrograms/cu m at the one side significant level of 1%. The distribution of Fe in airborne particulates was normal (4.3%, 1.9%). Atmospheric Fe concentrations around an iron manufacturing company were measured to determine the influence of wind direction and distance from the emission source upon atmospheric Fe concentrations. The maximum value of the Fe concentrations and Fe contents was 237 micrograms/cu m and 30.0% respectively. The high concentrations at 2.4 to 3.0 km distance were due to the effluents emitted from a 100 m high stack of a sintering plant. Source strengths calculated from the Fe concentrations at 2.4 to 3.0 km were nearly coincident with those of the sintering plant. The principal ingredients of airborne particulates collected at 2.4 to 3.0 km were silicon dioxide and alpha iron oxide.

44457

APTIC NO. 67508

Suginoto, Toshio

AIR POLLUTION RESULTING FROM VINYL CHLORIDE AND ETHYLENE DICHLORIDE IN TAKAOKA CITY. (*Takaokashi ni okeru onka bisin, echiren sikurorido no taiki oson*) Text in Japanese. *Japan Environmental Health Center, Proc. Conf. Environ. Health*, 18th, Fukui, Japan, 1974. p. 80-81. (Oct. 3-4.)

Takaoka is one of the leading industrial towns in Japan with a conglomerate of chemical, pulp, and steel industries, and problems of air and river pollution are multiplying. At several measuring points, air samples were collected by the low temperature adsorption method using liquid oxygen. The samples collected were analyzed by gas chromatography with flame ionization detector and mass spectrometry. The substances identified besides components of gasoline exhaust gas were ethylene dichloride, vinyl chloride, methyl mercaptan, dimethyl sulfide, benzene, and toluene. The pollution by vinyl chloride type compounds is characteristic of this area, and the daily distribution of C₂H₂Cl₂ concentration was in the range of 26.8-0.9 ppb and C₃H₃Cl was in the range of 5.6-0.9 ppb, which decreased with the distance from industrial pollutant sources.

44459

APTIC NO. 67509

Tamura, Kunio and Shinichi Nomoto

A TRIAL FOR SO₂ CONCENTRATION FORECASTING. (*SO₂ nodo yosoku no kokoromi*) Text in Japanese. *Kishocho Gijutsu Shiryō: Taiki Oson Kisho Yoho Shiryō* (Air Pollut. Weather Forecasting Data), 15(2):137-141, Feb. 1974.

By formulating empirical equations for use on a computer, it was possible to forecast the sulfur dioxide concentrations in the Tokyo region to a reasonable degree of accuracy. The variations in the calculated SO₂ concentrations approximated

the actual variations. The maximum error was 1.5 times the actual concentration. The minimum error was 0.5 times the actual concentration. The average error was 0.8 times the actual concentration.

TAIPEI METEOROLOGICAL DATA FOR AIR POLLUTION IN 1973. (*Taipei shi tenki kokuji 1973*) Text in Chinese. *Taipei shi tenki kokuji 1973* (Taipei shi tenki kokuji 1973), 1974. 3 refs.

A statistical analysis of the meteorological data for the year 1973 in Taipei is presented. The data are divided into four seasons: winter (Dec. to Feb.), spring (Mar. to May), summer (Jun. to Aug.), and autumn (Sep. to Nov.). The data are presented in the form of tables and graphs. The data show that the average temperature in 1973 was 22.5°C, the average precipitation was 1815 mm, and the average relative humidity was 78%.

TAIPEI METEOROLOGICAL DATA FOR AIR POLLUTION IN 1973. (*Taipei shi tenki kokuji 1973*) Text in Chinese. *Taipei shi tenki kokuji 1973* (Taipei shi tenki kokuji 1973), 1974. 3 refs.

In the Kite district in Taipei, a survey of air pollution was conducted for sulfur dioxide, nitrogen dioxide, and carbon monoxide. The data show that the average concentration of sulfur dioxide was 0.12 mg/m³, the average concentration of nitrogen dioxide was 0.08 mg/m³, and the average concentration of carbon monoxide was 1.2 mg/m³. The data also show that the average temperature was 22.5°C, the average precipitation was 1815 mm, and the average relative humidity was 78%.

44461

APTIC NO. 67511

Office of Air and Waste Management, Research Triangle Park, N. C., Monitoring and Data Analysis Div.

AIR QUALITY DATA - 1973 FINAL QUALITY STATISTICS (FINAL REPORT). Report number: EPA-600/3-74-007, 101p., May 1974. 3 refs.

NTIS: PB 237543/AS

First quarter statistics for 1973 air quality data are presented that currently have National Ambient Air Quality Standards are presented. Pollutants covered by the data include particulates, carbon monoxide, sulfur dioxide, nitrogen dioxide, and hydrocarbons, total oxidants, and ozone. Data are presented corresponding to one of the pollutants covered and also data on collection and analysis techniques employed. The summary format provides both parametric and nonparametric indices of air quality. The number of observations, the minimum and maximum value measured for the period of record, and the 5th deciles plus the 95th and 99th percentiles describe the distribution.

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tion of observed values. Each summary line is preceded by the Air Quality Control Region within which the sampling site is located, the city or county (parish, election district, or regional planning district), the three-digit site number within the city or county, and an Agency Type Code that indicates the type of agency responsible for the laboratory analysis. A Project Code is shown with the Agency Type Code to indicate the type of surveillance being conducted.

44462

APTIC NO. 67815

Office of Air and Waste Management, Research Triangle Park, N. C., Monitoring and Data Analysis Div.

AIR QUALITY DATA - 1973 THIRD QUARTER STATISTICS (FINAL REPORT). Rept. EPA-450/2-74-011, 133p., May 1974. 3 refs.

NTIS: PB 237599/AS

Third quarter statistics for 1973 air quality data on pollutants that currently have National Ambient Air Quality Standards are presented. Pollutants covered by the data include: particulates, carbon monoxide, sulfur dioxide, nitrogen dioxide, total hydrocarbons, total oxidants, and ozone. Each section corresponding to one of the pollutants covered also shows the collection and analysis technique employed. The summary format provides both parametric and nonparametric indices of air quality. The number of observations, the minimum and maximum value measured for the period of record, and the odd deciles plus the 95th and 99th percentiles describe the distribution of observed values. Each summary line is preceded by the Air Quality Control Region within which the sampling site is located, the city or county (parish, election district, or regional planning district), the three-digit site number within the city or county, and an Agency Type Code that indicates the type of agency responsible for the laboratory analysis. A Project Code is shown with the Agency Type Code to indicate the type of surveillance being conducted.

44463

APTIC NO. 67816

Office of Air and Waste Management, Research Triangle Park, N. C., Monitoring and Data Analysis Div.

AIR QUALITY DATA - 1973 SECOND QUARTER STATISTICS (FINAL REPORT). Rept. EPA-450/2-74-010, 92p., May 1974. 3 refs.

NTIS: PB 237598/AS

Second quarter statistics for 1973 air quality data on pollutants that currently have National Ambient Air Quality Standards are presented. Pollutants covered by the data include: particulates, carbon monoxide, sulfur dioxide, nitrogen dioxide, total hydrocarbons, total oxidants, and ozone. Each section corresponding to one of the pollutants covered also shows the collection and analysis technique employed. The summary format provides both parametric and nonparametric indices of air quality. The number of observations, the minimum and maximum value measured for the period of record, and the odd deciles plus the 95th and 99th percentiles describe the distribution of observed values. Each summary line is preceded by the Air Quality Control Region within which the sampling site is located, the city or county (parish, election district, or regional planning district), the three-digit site number within the city or county, and an Agency Type Code that indicates the type of agency responsible for the laboratory analysis. A Project Code is shown with the Agency Type Code to indicate the type of surveillance being conducted.

44464

APTIC NO. 70836

Environmental Protection Agency, Athens, Ga., Surveillance and Analysis Div.

VINYL CHLORIDE MONITORING NEAR THE B. F. GOODRICH CHEMICAL COMPANY IN LOUISVILLE, KENTUCKY (FINAL REPORT). 63p., June 24, 1974.

The Environmental Protection Agency conducted ambient air monitoring of vinyl chloride in the vicinity of the B. F. Goodrich Chemical Company in Louisville, Kentucky, from

May 8, 1974 to May 16, 1974 as a follow-up to a preliminary investigation conducted on March 22-28, 1974. The plant manufactures synthetic plastic resins and synthetic rubber, with the major use of vinyl chloride monomer being the production of polyvinyl chloride. Ambient air samples were collected by three methods, including one integrated sample method and two grab sample methods. Among the integrated samples taken, 6% were greater than 1.0 ppm (24-hour average concentration); while 36% of the grab samples were over 1.0 ppm. Helicopter grab samples averaged 0.09 ppm, with the highest concentration being 0.25 ppm.

1973

44465

APTIC NO. 67564

Stante, Aldo and Nicola Virtu

AIR POLLUTION IN TARANTO (PART 2). SUSPENDED DUST AND GASEOUS POLLUTANTS. (*Inquinamento atmosferico a Taranto (2). Polvere sospesa e gas inquinanti*). Text in Italian. *Inquinamento Acqua Aria Suolo*, 15(1):15-22, Jan.-Feb. 1973. 10 refs.

The suspended dust, sulfur dioxide, and ammonia concentrations in the air in Taranto were studied by means of monitoring stations in 1970 and 1971. On the basis of the air pollution measurement data, the city of Taranto can be divided into two parts: one in which the suspended dust concentrations are both fairly high and independent of the meteorological factors, while the gaseous pollutants, such as SO₂ and NH₃, fail to amount to the lowest toxic concentrations; and another part in which the air pollution level is generally rather low. The SO₂ concentrations were highest during December, January and February, and lowest during June, July, and August.

44466

APTIC NO. 63948

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

THE 1973 AIR POLLUTION CONTINUOUS MONITORING, MEASUREMENT REPORTS. (*Taiki osen joji sokuteishitsu sokutei kekka hokoku*). Text in Japanese. 548p., July 1973.

The entire numerical data for the July 1973 (and in some cases for previous years) air pollution continuous monitoring and measurements for Tokyo are presented in tables, graphs, charts, and maps. The contents and methods of automatic recordings of pollutants were as follows: sulfur dioxide was measured by electroconductivity; oxidants were measured by neutral potassium iodide and absorption spectrophotometry; nitrogen oxides were measured by spectrophotometry with the Saltzman reagent; and carbon monoxide was measured by the light-scattering method. The measurements were taken every hour on the hour, and the units were: ppm for SO₂ and oxidants, ppm for CO, and mg/100 cu m for suspended particulates. Ppm indicated 1/100 ppm. The measurement data of 22 monitoring locations on general monitoring and those of 26 locations for monitoring of automotive exhaust gases are presented. There is no clear-cut pattern for the state of air pollution in Tokyo; but the SO₂ measurements at monitoring stations seem to show a trend in a decrease of yearly averages for more recent years, with the peak in 1966 and 1967.

44467

APTIC NO. 67690

Hokkaido Government (Japan), Dept. of Health

REPORT ON THE AIR POLLUTION INVESTIGATION AND MEASUREMENT IN HOKKAIDO, REPORT NO. 10. (*Hokkaido no taiki osen chosa sokutei kekka hokoku*). Text in Japanese. 385p., Nov. 1973.

The air pollution measurements in five cities in Hokkaido are presented in tables. The measurements in Sapporo are not included in this report, but the reason is not given. Settling particles by deposit gauges were monitored at eight locations in Muroran, nine in Tomakomai, six in Asahigawa, three in Obihiro, and five in Kushiro. Fluoride was measured by al-

kaline filter paper at 13 locations in Tomakomai. Sulfur oxides are measured by lead dioxide at eight locations in Muroran, 23 in Tomakomai, 11 in Asahigawa, three in Obihiro, and five in Kushiro; sulfur dioxide is measured also by electroconductivity at four locations in Muroran, five in Tomakomai, one each in Asahigawa and Obihiro, and two in Kushiro. The measurements for 1972 are presented in tables and printouts. The PbO₂ monthly averages of SO_x in Muroran ranged from 0.3 to 1 mg/day/100 sq cm. The highest measurements were 1.4 mg in April and December at two different locations. The Tomakomai averages were from 0.11 to 58 mg/day/100 sq cm; the three other cities ran about the same figures. The fluoride pollution in Tomakomai was 0.11 microgram to 8.72 microgram/day/100 sq cm. The highest single average was 25.76 microgram/day 100 sq cm in August at one location, which also had a high figure of 23.91 micrograms in July, but as low as 0.61 micrograms in November. The reason is not clear. The most polluted city by settling particulates was Muroran, where in winter months, the dust accumulations were 99.8 tons or 100.8 tons/sq km/month.

44468

APTIC NO. 67754

Office of Air and Water Programs, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

THE NATIONAL AIR MONITORING PROGRAM: AIR QUALITY AND EMISSIONS TRENDS ANNUAL REPORT (VOLUME II). Pub-EPA-450/1-73-001-b, 257p, Aug. 1973.

NTIS: PB 227272/2GA

Trends in air quality and emissions were evaluated on a national and regional basis. Based on data from the National Air Sampling Networks, air quality trends are presented for total suspended particulates for 1960 through 1971, carbon monoxide, oxides of nitrogen, and oxidants for 1972 through 1971, and sulfur dioxide for 1964 through 1971. Included is a detailed evaluation of ambient air quality for three Air Quality Control Regions. For the period 1940 through 1970, emissions trends are presented on a national basis only. Air quality data, emission data for various sources, and summaries of monitoring activities are presented for each State and Air Quality Control Region. Specific programs areas emphasized are data acquisition and analysis, and trend identification and interpretation. (Author abstract modified)

1971

44469

APTIC NO. 70030

Salvaggio, John, Lawrence Zaslav, John Greer, and John Seabury

NEW ORLEANS ASTHMA III. SEMIQUANTITATIVE AEROMETRIC POLLEN SAMPLING, 1967 AND 1968. *Ann. Allergy*, vol. 29:305-317, 1971. 20 refs. (Also: *Ecological and Biological Effects of Air Pollution*. Vol. 4, New York, MSS Information Corp., 1973, p. 62-74.)

A semiquantitative survey of atmospheric pollen in New Orleans was made using automatic intermittent rotolide samplers during 1967 and 1968. Major pollen seasons of the most common trees began with juniper and cypress (Cupressaceae and Taxodiaceae) in late November and ended with walnut (Juglandaceae), pecan-hickory (Carya), and oak (Quercus) in late May. Pollens of grasses (Gramineae) and plantain (Plantaginaceae) were detected throughout the year except for a brief period between late December and January. Pollen of the ragweed tribe (Compositae-Ambrosiaceae) was initially detected in early June, reached a peak from mid-September through mid-October, and waned with the first killing frosts in late November. Consistently higher concentrations of pollen were observed with ground level (8 ft) as opposed to 150 ft level samplers. These differences were likely due to sampler location rather than height. Although the anemophilous trees generally produced similar quantities of pollen to Ambrosiaceae, epidemics of bronchial asthma in the community occur in

greater frequency and magnitude at the height and termination of Ambrosiaceae pollination. (Author summary modified)

1963

44470

APTIC NO. 67450

Palan, S.

POLLUTION OF ATMOSPHERE IN THE AREA OF ENO PLANT. (*Znečistenie ovzdušia v oblasti závodu eno*). Text in Czech. *Cesk. Hyg. Prague*, vol. 6:364-371, 1963. 16 refs.

Dust-fall, atmospheric soot, and arsenic compound concentrations in the atmosphere, snow, and fallout are reported for an area in the vicinity of a heat-electric works where lignite containing arsenic and sulfur compounds is combusted. The effectiveness of electrostatic precipitators is discussed in relation to eliminating individual fractions of the ash, particularly arsenic compounds. All substances measured in the study, with the exception of sulfur dioxide, are found to exceed the maximum tolerable average daily concentration. Suggestions are made for hygienic measures.

1956

44471

APTIC NO. 67451

Roubal, J. and V. Vasak

POLLUTION OF THE ATMOSPHERE BY COMPOUNDS OF ARSENIC WHEN METALLURGICALLY WORKING UP LEAD ORES. (*Znečistování ovzduší sloučeninami arsenu při hutnickém zpracování olovených rud*). Text in Czech. *Cesk. Hyg. Prague*, vol. 1:129-134, 1956. 6 refs.

Arsenic is determined in dust dispersions in the neighborhood of a lead-ore metallurgical works. The potential danger of the atmospheric pollution is discussed, and technical defects in the dusting of gas emissions are cited as responsible for high arsenic concentrations within the metallurgical facility as well as in the surrounding area.

1952

44472

APTIC NO. 67442

Goulden, F., E. L. Kennaway, and M. E. Urquhart

ARSENIC IN THE SUSPENDED MATTER OF TOWN AIR. *Brit. J. Cancer*, 6(1):1-7, March 1952. 14 refs.

The arsenic content of suspended particulate matter from eight towns in England was analyzed during different seasons of the year. The monthly means from the eight localities were about twice as great during November, December, and January (0.104 micrograms) as compared to the rest of the year. The seasonal change was less than that found for benzpyrene, suggesting that arsenic is less predominantly a contribution from domestic smoke. The association of smoking with lung cancer, together with the higher incidence of this form of cancer in towns, was suggested to be due not only to different smoking habits in town dwellers but also to a summation of carcinogenic factors, with arsenic and benzpyrene perhaps exerting a supplementary effect.

ATMOSPHERIC INTERACTION

1974

44473

APTIC NO. 67885

Beard, K. V.

EXPERIMENTAL AND NUMERICAL COLLISION EFFICIENCIES FOR SUBMICRON PARTICLES SCAVENGED BY SMALL RAINDROPS. *J. Atmospheric Sci.*, 31(6):1595-1603, Sept. 1974. 27 refs.

Experimental scavenging efficiencies were measured for freely falling drops of 0.40-0.85 mm diameter and charges of .00001 to .001 electrostatic units supported by the vertical airstream of a cloud tunnel. The airstream particles, produced from indium acetylacetonate using a La Mer generator, were 0.4 micron in radius and 1.5 g/cu cm in density. Collection efficiencies of .0001 to .001 determined by neutron activation analysis were used to provide a test of an expanded theoretical model of Beard and Grover where collision efficiencies are based on a numerical description of axisymmetric, steady-state flow about rigid spheres up to Reynolds number 400. Scavenging mechanisms were examined to determine the important forces on the particle, and the coulomb force between a charged drop and charged particle was included in the equation of particle motion for particles moving in a gravitational field with a Stokes-Cunningham resistance in the imperturbed flow of the drop. Numerically evaluated collision efficiencies appeared to increase for the smaller particles due to wake capture even without electrostatic effects. The theoretical model predicted to within a factor of two the experimental results for negligibly charged drops scavenging submicron particles. The numerical results partially resolved inconsistencies of previous experiments in accounting for apparent electrostatic and wake effects. (Author abstract modified)

44474

APTIC NO. 67467

Bullrich, K., R. Eiden, G. Eschelbach, K. Fischer, G. Haenel, and J. Heintzenberg

SCATTERING AND ABSORPTION FROM POLY-DISPERSED AEROSOLS. *Dept. of Transportation; National Aeronautics and Space Administration; T.R.W. Systems, Inc.; Army Research Office; and California Univ., Los Angeles, Dept. of Meteorology, Proc. Int. Conf. Remote Prob. Atmos., Los Angeles, Calif., 1973, p. 135-161, 1974. 50 refs. (Aug. 28-30.)*

Numerical computation results are given for diffuse sky radiances and degree of polarization. The results are obtained by solving the equation of radiative transfer in the formulation of Eschelbach. Multiple scattering and absorption by aerosol particles are considered in the computations, and results from experimental measurements of the complex refractive index of aerosol samples at different relative humidities are also presented. Radiation flux divergences computed from the determined properties of atmospheric aerosol particles are used to derive atmospheric heating rates which appear comparable to the heating rates by water vapor. The extent to which these heating rates are compensated by cooling from the infrared emission of aerosol particles is not examined. (Author abstract modified)

44475

APTIC NO. 67636

Davis, D. D., G. Smith, and G. Klauber

TRACE GAS ANALYSIS OF POWER PLANT PLUMES VIA AIRCRAFT MEASUREMENT: O₃, NO_x, AND SO₂ CHEMISTRY. *Science*, 186(4165):733-736, Nov. 22, 1974. 8 refs.

The gaseous plume from an isolated 1000-megawatt power plant was systematically examined from a single engine aircraft to determine the extent to which nitrogen oxide and sulfur dioxide chemistry occurs as a function of distance. The concentrations of ambient ozone, water vapor, and hydroxyl

free radicals were of major importance in defining the chemistry of power plant plumes during summertime conditions. (Author abstract)

44476

APTIC NO. 67562

Detwiler, Andrew

URBAN INFLUENCE ON CUMULUS FORMATION.

Bull. Am. Meteorol. Soc., 55(10):1240-1241, Oct. 1974. 5 refs.

A photograph taken from a multispectral scanner aboard a satellite is presented to show the influence of the Chicago-Hammond-East Chicago-Gary metropolis on cumulus formation. The shadow cast by the individual cumulus elements indicate a cloud base around 1 km and very moderate vertical development. The width of the largest line elements approaches 1.5 km, and the elements themselves seem to show a wavelength of 1.5-2.0 km. The most striking feature about the photograph is the coincidence of the upwind end of several of the lines. Elsewhere in the frame, the wind off the lake appears to inhibit cumulus formation within 10 km of the lakeshore, while over Hammond-East Chicago a 25 km long line of cumulus begins within 2 km of the shoreline in an area containing several steel mills and oil refineries. A cluster of mills and a fossil-fueled power plant just to the northwest also seem to be spawning cumuli.

44477

APTIC NO. 67890

Easter, Richard C. and Peter V. Hobbs

THE FORMATION OF SULFATES AND THE ENHANCEMENT OF CLOUD CONDENSATION NUCLEI IN CLOUDS. *J. Atmospheric Sci.*, 31(6):1586-1594, Sept. 1974. 24 refs.

A mathematical model is developed for predicting the production of ammonium sulfate by oxidation of dissolved sulfur dioxide in cloud droplets of small-amplitude wave clouds and the resulting enhancement of cloud condensation nuclei released from the clouds on evaporation. The condensational growth of the droplets formed on 75 initial cloud condensation nuclei sizes is considered simultaneously with the production of sulfates in the droplets of an air parcel moving through a wave cloud via the Scott-Hobbs mechanism. Significant increases in the concentrations of cloud condensation nuclei active at 0.5% supersaturation can be produced by SO₂ oxidation in wave clouds with short flow-through times (4 min) and with concentrations of SO₂ and ammonia typical of unpolluted air (1 and 3 ppb, respectively). The sulfate production decreases as the SO₂ concentration rises above 10 ppb due to the limited buffering capacity of the NH₃. In-cloud production of ammonium sulfate can probably explain previous observations of higher than ambient cloud condensation nuclei concentrations in air from evaporating clouds, with the ammonium sulfate production in clouds being sufficiently fast to account for the major worldwide source of these particles. (Author abstract modified)

44478

APTIC NO. 67557

Endo, Yonekichi

THE 850 MB TEMPERATURE FIELD AND PHOTOCHEMICAL SMOGS IN AICHI PREFECTURE. (850 mb no ondojo to Aichi-ken no kokagaku sumogu ni suite). Text in Japanese. Tokyo Kanku Chihō Kisho Kenkyukai-shi (Geophys. Notes, Tokyo Distr. Meteorol. Obs.), no. 7:235-238, Sept. 1974.

Generally, air pollution is influenced by various meteorological factors at a relatively low altitude. A simple investigation of the relationship between the 850 mb thermal field characteristics and photochemical smogs was conducted because warm air current and stability at lower altitude seemed to be two definite reference factors when predicting pollution potentials. Studies were made of the temperature isopleth at 850 mb, the movement of isotherms, the vertical temperature variation at the lower altitude, and analyses of distribution

maps. The rise of temperature at 850 mb enhanced the stability of the atmosphere at the lower altitude and therefore contributed to the increase of oxidant concentration. The movement of warm air frequently came from middle China, circling around the perimeter of sub-high pressure areas and finally entering the territory of Japan. The increase of warm current continuing from the preceding day was closely related to the rise of oxidant level on a given day.

44479

APTIC NO. 67919

Hameed, S.

A MODIFIED MULTI-CELL METHOD FOR SIMULATION OF ATMOSPHERIC TRANSPORT. *Atmos. Environ.*, 8(10):1003-1008, Oct. 1974. 6 refs.

A multi-cell method for simulation of atmospheric transport is presented in which the cells are assumed to be open at the top (thus removing the need for the prescription of cell heights). The method is applied to the calculation of the dispersion of sulfur dioxide for a 2-hour period in Nashville, Tennessee. The basic assumption of the cell model is that the contaminants are readily carried and mixed by the wind and this results in a concentration field which, at any given time, is locally uniform. The region under study is divided into control cells for each of which, assuming the concentration to be uniform, the mass conservation equation can be solved to obtain local concentration. The assumption of uniform distribution becomes better with decrease in the size of cells. Because the wind direction is horizontal, uniform mixing in this direction is a plausible approximation. The cell model assumes a physically realistic vertical distribution, rather than the assumption of a uniform vertical distribution of concentration with an arbitrary cell height, which is a feature of conventionally used multi-cell models. The calculation for Nashville shows that the modified method yields a concentration field which agrees well with the observed one in terms of qualitative features of distribution and the magnitude of relative error. (Author abstract modified)

44480

APTIC NO. 67536

Holzworth, George C.

SUMMARIES OF THE LOWER FEW KILOMETERS OF RAWINSONDE AND RADIOSONDE OBSERVATIONS IN THE UNITED STATES. *Preprint, American Meteorological Society*, 25p., 1974. 2 refs. (Presented at the American Meteorological Society Climatology Conference and Workshop, Asheville, N. C., Oct. 8-11, 1974.)

The lower few kilometers of routine rawinsonde observations made at 0000 and 1200 GMT, and of soundings made in support of air pollution control agencies were analyzed and summarized for most National Weather Service upper-air observing stations in the United States. An arbitrary method was used to simplify complex inversions. The summaries include the base height, thickness, and $\Delta T/\Delta Z$ (change in temperature/change in inversion thickness) values of inversions; $\Delta T/\Delta Z$ values in the layer beneath elevated inversions and in specified layers when there is no inversion; average relative humidity within, above, and below inversions, and in specified layers when there is no inversion; and winds aloft to 1200 m by inversion base height and thickness as well as for noninversion observations. The processed data for each sounding, the summaries, and their availability are described. (Author abstract modified)

44481

APTIC NO. 67924

Johnson, David L. and Robert S. Braman

DISTRIBUTION OF ATMOSPHERIC MERCURY SPECIES NEAR GROUND. *Environ. Sci. Technol.*, 8(12):1003-1009, Nov. 1974. 26 refs.

The chemical speciation of atmospheric mercury was studied as a function of local geographic variation and diurnal variation at a single location using samples taken near the ground in the Tampa Bay area. Mercury, for the most part, was in the

volatile form, with the particulate fraction averaging only 4% of the total mercury in 54 speciation measurements. The other 96% was divided as follows: mercury(II)-type compounds, 25%; methylmercury-type compounds, 21%; elemental mercury, 49%; and dimethylmercury-type compounds, 1%. Southern stations showed higher mercury values than the northern stations. Results from two diurnal studies suggested that emanation from the ground is another general source for a number of atmospheric mercury species, with total mercury tending to increase at night and decrease in the daytime in direct opposition to the air temperature fluctuation. The percentage distribution of mercury species showed much less regular variation between night and day than did total mercury, suggesting that ambient atmospheric mercury speciation in a given area may be controlled by processes occurring in the ground. The results were generally quite variable, suggesting a variety of sources and irregular wind transport processes.

44482

APTIC NO. 64373

Kalpazanov, J. and G. Kurtschatova

AN ATTEMPT FOR DETERMINING SOME MULTIPLE REGRESSIONS AND CORRELATIONS OF THE POLLUTION OF THE AIR BY PHENOL IN SOFIA. (*Ein Versuch zur Ermittlung einiger multipler Regressions- und Korrelationsbeziehungen der Verunreinigung der Luft durch Phenol in Sofia*). Text in German. *Z. Ges. Hyg. ihre Grenzgebiete (Berlin)*, 20(7):411-413, 1974.

Daily meteorological observations and measurements of phenol pollution in Sofia and in the area of a large industrial enterprise near the city were analyzed by electronic data processing. A multiple regression equation was derived for the influence of air temperature, relative humidity, wind speed, and phenol concentration. The phenol concentrations influenced air pollution and wind speed was important in the self-purification of the atmosphere.

44483

APTIC NO. 67548

Kasuya, Mitsuo

A COMMENT ON THE OSAKA DISTRICT WEATHER REPORT NOS. 822 AND 824. (*Osaka kanku joho (No.822, No.824) o yonde*). Text in Japanese. *Kishochu Gijutsu Shiryo: Taiki Osen Kisyo Yoho Shiryo (Air Pollut. Weather Forecasting Data)*, 15(2):75-76, Feb. 1974.

Some brief, unrelated comments are given on photochemical smog and weather. Photochemical smogs can occur on days of thunder showers when the localized air mass bundle appears on a front and a weak pressure gap is created near the ground surface. Smogs can also occur immediately before thunder starts when the trough passes the altitude of about 2000 m. But on such days, when the oxidant concentration rises and a warning is about to be issued, suddenly clouds can disperse and the oxidant concentration can decrease. It is usually believed that smogs occur when the wind velocity is less than 4 m/sec; but this is not necessarily so. It can occur at the meeting place of two opposite winds, one a predominant wind and the other a sea breeze. Usually the photochemical reaction altitude is about 300 m; but from actual observations, high concentrations can occur in high altitudes of 800-1000 m.

44484

APTIC NO. 67583

Kitabayashi, Koji and Nagayuki Yokoyama

STIMULATION OF ATMOSPHERIC POLLUTION IN INDUSTRIAL CITIES. (*Kogyo-toshi-iki no taiki osen simulation*). Text in Japanese. *Sangyo Kogai (Ind. Public Nuisance)*, 10(8):2074-2083, Aug. 1974. 4 refs.

The concentration distribution of sulfur oxides in Mizushima district, Okayama Prefecture, was simulated by the use of an environmental pollution simulation model which incorporates the models of plume and puff, wind direction, wind velocity and the amount of sunshine. The result reproduced the pollution concentration within an error of about 10% for the annual average concentration. The concentration cumulative up-

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pearance frequency curve, the so-called P-C curve, was reproduced up to a value of 90 percentile. This simulation model can determine the frequency of appearance and the grade of stability based on meteorological data. Therefore, this simulation can be applied to regions where pollution is not remarkable at present unless the topographic effect is predominant. The details of the simulation were as follows: of all the possible combinations of 32 wind directions, 5 classes of wind velocity, and 5 classes of stability, those with more than 0.05% of appearance frequency were selected for the calculation of concentration distribution at the ground surface. Annual average concentration, average concentration for each season, and the relation between the concentration and the cumulative frequency of appearance were calculated.

44488

APTIC NO. 67466

Kuriyan, Jacob G.

PARTICULATE SIZES FROM POLARIZATION MEASUREMENTS. Dept. of Transportation; National Aeronautics and Space Administration; T.R.W. Systems, Inc.; Army Research Office; and California Univ., Los Angeles, Dept. of Meteorology, Proc. Int. Conf. Rad. Remote Prob. Atmos., Los Angeles, Calif., 1973, p. 337-366, 1074. 12 refs. (Aug. 28-30.)

Experiments with a ground based polarimeter for remote measurements of polarization and intensity are described along with the theory necessary to infer the optical properties of particles in the atmosphere from measurements of the radiation field. Equivalent haze parameters arrived at from a set of haze parameters associated with an optical model used for expressing the radiative calculations of aerosol effects, suggesting that the radiation field measurements alone will not enable the determination of exact size distributions. The parameters provide an equivalent optical description which can be used to calculate radiative effects such as cooling and heating. The coupling of in situ techniques with polarimeter measurements, followed by introduction of the in situ results into the radiative transfer equation for reproduction of the radiation field measured by the polarimeter is suggested for future investigations.

44486

APTIC NO. 67926

Maki, Shigeteru, Junichi Sakai, and Eisaku Murata

ATMOSPHERIC DIFFUSION WIND TUNNEL WITH AUTOMATIC MEASUREMENT. (Taiki kakusan fudo setsu bi to jido sokutei). Text in Japanese. Ehara Jiho (Ehara Times), no. 89:15-21, 1974.

A wind tunnel which permits estimates of atmospheric diffusion is described. Smoke from power plant smoke stacks, for example, can be simulated and traced to determine the manner of diffusion in the air as well as the grade of dilution. The wind tunnel is also capable of temperature controlled diffusion tests in which temperature distribution inside the wind tunnel is controlled. A minimum wind velocity of 10 cm can be obtained with accuracy within plus or minus 0.05% using a controlled direct current motor; diffusion tests are often made at low wind velocity. Fully automatic measurements can be obtained by using a minicomputer such that the operation and reading of the measuring instruments can be remotely controlled from the measuring chamber.

44487

APTIC NO. 67463

McClatchey, Robert A.

MOLECULAR ABSORPTION PARAMETERS IN ATMOSPHERIC MODELLING. Dept. of Transportation; National Aeronautics and Space Administration; T.R.W. Systems, Inc.; Army Research Office; and California Univ., Los Angeles, Dept. of Meteorology, Proc. Int. Conf. Rad. Remote Prob. Atmos., Los Angeles, Calif., 1973, p. 431-470, 1974. 35 refs. (Aug. 28-30.)

Molecular spectroscopic parameters for a number of infrared-active molecules occurring naturally in the terrestrial at-

mosphere are compiled and related to atmospheric models. Molecules included in the compilation are: water vapor, carbon dioxide, ozone, nitrous oxide, carbon monoxide, methane, and oxygen. The spectral region covered extends from less than 1 micron to the far infrared, and data are presented on more than 100,000 spectral lines. The parameters included in the compilation for each line are: frequency, intensity, half-width, energy of the lower state of the transition, vibrational and rotational identifications of the upper and lower energy states, an isotopic identification, and a molecular identification. Using this data compilation, band model parameters are presented for water vapor, CO₂, and O₃, averaged over 20 wavenumber intervals between 10 and 2500/cm. Transmittance spectra are provided and compared with both degraded monochromatic calculations and laboratory data. (Author abstract modified)

44488

APTIC NO. 67727

Molenkamp, Charles R.

A ONE-DIMENSIONAL NUMERICAL MODEL OF PRECIPITATION SCAVENGING WITH APPLICATION TO RAINOUT OF RADIOACTIVE DEBRIS. California Univ., Livermore, Lawrence Livermore Lab., Atomic Energy Commission Contract W-7405-Eng-48, UCRL-51627, TID-4500, UC-11, 39p., July 17, 1974. 20 refs.

NTIS: UCRL-51627

A one-dimensional, time-dependent, entrainment model of cumulus convection was modified to include a calculation of precipitation scavenging. The primary method of scavenging was postulated to be collection of suspended debris in cloud droplets during condensation nucleation and the subsequent inertial capture of these polluted droplets by falling raindrops. Other possible collection mechanisms were neglected, including inertial capture of debris particles by falling raindrops and attachment of debris to droplets or drops because of phoretic, diffusive, or electrical forces. Resuspension of debris because of evaporation of droplets and drops was modeled. Scavenging by a typical cumulus cell was calculated. Parameter studies were performed to examine the dependence of debris deposition on the initial height of debris in the atmosphere and on the fraction of debris passing through the condensation nucleation activation zone that serve as condensation nuclei. (Author abstract)

44489

APTIC NO. 67989

Nicholas, G. W. and D. M. Sopocy

EVALUATION OF COOLING TOWER ENVIRONMENTAL EFFECTS. Combustion, 46(5):34-41, Nov. 1974. 24 refs.

Cooling towers interact with the environment through the discharge of blowdown to a lake or stream and through the emission of moisture and warmed air to the atmosphere. The environmental effects of these interactions can be evaluated by measuring various physical and chemical properties of the cooling system and of the ambient meteorology and hydrology. Blowdown parameters used in this evaluation are temperature, pH, flow rate, total dissolved solids, biocide, and inhibitor concentrations. In addition to meteorological parameters, the atmospheric parameters which require evaluation include fogging, drift, salt deposition, and moist plume characteristics. The instrumentation needs for monitoring these parameters are discussed with respect to current status. Concepts and instrumentation requiring additional development are also cited. Instrumentation required for the measurement of meteorology, humidity, wind speed and direction, atmospheric temperature and stability, height of the mixed layer, fogging, visibility, and drift are included. Fog dispersal techniques are mentioned. (Author abstract modified)

44490

APTIC NO. 67920

Nunge, Richard J.

APPLICATION OF AN ANALYTICAL SOLUTION FOR UNSTEADY, ADVECTIVE-DIFFUSION TO DISPERSION IN THE ATMOSPHERE--I-II. 1-THEORY.

Atmos. Environ., 8(10):969-1001, Oct. 1974. 3 refs.

The theory of an exact analytical procedure for solving the unsteady, advective-diffusion equation is developed for an empirical eddy diffusivity model of dispersion in the atmosphere. The main advantage of the technique is that it allows the prediction of the point concentration in time and space, and thus may be used to investigate pollutant cloud movement and ground level concentrations. Since analytical solutions are obtained, the method is useful for testing numerical integration schemes, for rapid estimations of dispersion under different conditions, and for approximations to more complex situations wherein the heat, mass, and momentum transport processes in the atmosphere cannot be uncoupled. The method is developed for three-dimensional initial value problem with the downwind coordinate oriented in the direction of the mean wind so that the crosswind velocity component may be ignored. Generalizations to include the crosswind component, first-order chemical reactions, and continuous, time-dependent, distributed sources are discussed. Particular solutions of the dispersion problem are obtained for a linear time-independent wind in three dimensions and for a time-dependent, periodic wind in a two-dimensional model. (Author abstract modified)

44491

APTIC NO. 67698

Ota, Seizo

STATISTICAL PRELIMINARY INVESTIGATION IN OTAKE FOR THE SO₂ POLLUTION WEATHER FORECASTING. (*Otake-shi ni okeru SO₂ taiki osen kisho yoho no tame no tokeiteki yobi chosa ni tsuite*). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), 15(2):80-82, Feb. 1974.

For the forecasting of air pollution weather, a preliminary statistical investigation was conducted in Otake city. Otake is an industrial city with a narrow strip of land flanked by hills on the west side and by the Inland Sea on the east side. The shoreline is a large industrial complex and a number of small islands. The sea breeze is weak and pollutant dispersion is difficult. The weather data was taken from the Prefectural government records between April 1968 and March 1969. Electroconductivity measurements of sulfur dioxide were taken at two locations. Statistical analysis methodology is discussed. Important factors in forecasting were the relationship between temperature differential of two locations and the day's minimum temperature, and the temperature differential and the day's average temperature. However, these data are not readily available in the daily weather observation. Therefore, the most important two factors were determined as the relationship between pressure difference and pollution index at 9 am and that at 9 pm.

44492

APTIC NO. 67603

Reiter, R., R. Sladkovic, and W. Carnuth

PARAMETRIZATION OF AEROSOL EDDY DIFFUSION CONTROLLED BY AEROLOGICAL STRUCTURE.

Arch. Meteorol. Geophys. Bioklimatol., Ser. A, Vienna, 23(3-4):297-322, 1974. 6 refs.

The effects of aerological fine-structure on vertical distribution of aerosols were studied with emphasis on vertical eddy diffusion. The parameterization was based on a recently improved theoretical derivation of exchange coefficients from vertical profiles of particle concentration and on tracer data obtained. Continuous recordings were made of radon concentrations at 740 m, 1780 m, and 3000 m along with air conductivities and Aitken nucleus concentrations. Exchange and diffusion coefficients were derived from this data. The functions obtained can be used to determine stratified exchange intensity from radiosonde ascents. (Author summary modified)

44493

APTIC NO. 67703

Sato, Isao

THE CONDITIONS OF PHOTOCHEMICAL SMOG PEAKS (SUMMER) IN THE KINKI REGION.

(*Kokugaku sumoggu seikaki no Kinki chiho no jokyo ni tsuite*). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), 15(2):1-5, Feb. 1974.

The potential photochemical smog forecastings in Osaka in 1972 were 31, in 1973 were 39; smog warnings, 18 and 24; and alerts, zero and 1. All the 1972 figures included the period May to October, but the 1973 figures included only up to August. In Osaka, a forecasting is issued when the hourly index of oxidants exceeds 0.10 ppm; a warning when the figure exceeds 0.15 ppm, and an alert, 0.3 ppm. The alert was issued on August 11, 1973, when the oxidant level exceeded 0.3 ppm. In July, 17 forecastings were given for potential photochemical smog, and 10 of them developed into the warning level. Photochemical smogs come in two types: one involves the stagnation of nitrogen oxides and hydrocarbons in the air; the other has weather conditions that would easily lead to photochemical reaction of any stagnating pollutants. The first has weak winds and settling of air masses; and the other has enough sunshine and high temperature. Smog potential forecastings do not require any emission control at the present time and therefore forecasting contributes nothing to smog control. On the other hand, only 65% of the potential smog forecasting in the summer of 1973 were accurate when issued on the same day, and only 51% were accurate when issued on the previous day.

44494

APTIC NO. 67931

Shikata, H. and K. Asakura

SIMULATING METHOD OF MULTIPLE SOURCES DISPERSION. (*Engen kibobetsu no eikyodo o korvo shita haen kakusan shimureshon shubo*). Text in Japanese. Denryoku Chuo Kenkyusho Gijutsu Daiichi Kenkyusho Hokoku (Tech. Lab. Central Res. Inst. (No. 1) Electric Power Ind., Rept.), no. 73088:30p., May 1974.

A method for constructing a simulation model of multiple source dispersion in an industrial area is described which can predict both hourly averaged concentrations and long-term averaged concentrations of pollution. The method uses hourly averaged meteorological data, long time averaged source emission data, and past time ground level concentrations. Emission sources are grouped into three classes for considering the differences of dispersion fields with source height. Smoke spreading is classified into five principal patterns corresponding to thermal stability and inversion height along with wind direction and speed data, isolation, and time. Parameters are introduced to correct the computed dosage of air pollution for each class of sources, with the parameters being calculated by regression analysis to minimize the error between the computed ground level concentration and the observed concentration over the area. Parameters are also introduced to correct the values of concentrations computed under conditions for each smoke spreading pattern.

44495

APTIC NO. 67645

Whelpdale, D. M.

PARTICULATE RESIDENCE TIMES. Water, Air, Soil Pollut., 3(3):293-300, Sept. 1974. 10 refs.

Examination of suspended particulate concentration data from a year-long, regional air quality study of a portion of the Great Lakes area revealed that depletion of particulates occurred during extended periods of travel over water surfaces. Based on particulate concentrations and meteorological measurements, residence times of background regional particulate matter were between 5 and 16 hr in the region. Using a simple model for the deposition of particulate matter into the lakes, deposition rates ranging from 0.2 to 3.9 micrograms/sq m/sec were found. This results, for example, in an estimated 150

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metric tons of material being deposited into Lake St. Clair, with an area of 1270 sq km, during a 24-hour period. (Author abstract modified)

44496

APTIC NO. 67465

Yamamoto, Giichi and Masayuki Tanaka

RADIATIVE TRANSFER OF VISIBLE RADIATION IN TURBID ATMOSPHERES. Dept. of Transportation; National Aeronautics and Space Administration; T.R.W. Systems, Inc.; Army Research Office; and California Univ., Los Angeles, Dept. of Meteorology, Proc. Int. Conf. Rad. Remote Prob. Atmos., Los Angeles, Calif., 1973, p. 74-134, 1974, 64 refs. (Aug. 28-30.)

Recent advancements in the study of radiative transfer of visible radiation in turbid atmospheres are reviewed. Topics examined include: representative methods of solving equations of radiative transfer; the relation between atmospheric turbidity and reflectivity of the atmosphere, including the earth's heat budget; the flux divergence of solar radiation inside the turbid atmosphere occurring as a result of the absorptive property of aerosols; and the problems of the intensity distribution of diffuse radiation and its state of polarization. The effect of increasing aerosols resulting from increased industrial activity is analyzed using a previously compiled vertical distribution of aerosols, a previously proposed haze model, and an equation describing the optical thickness due to aerosols. Such quantities as the phase function, albedo for single scattering, and extinction coefficients which are necessary for computation are evaluated based on Mie theory. The surface reflection is assumed to follow the Lambert law of reflection, and the average reflectivity for sea and land surfaces is assumed to be 0.05 and 0.15, respectively. The values of turbidity are changed from those for the pure Rayleigh atmosphere to values corresponding to the atmosphere over large cities.

1973

44497

APTIC NO. 67612

Amaya, Kazuo

TECHNICAL PROFILE IN TOTAL EMISSION REGULATION - TECHNICAL PROBLEMS FOR THE EFFECTUAL ENFORCEMENT OF TOTAL EMISSION REGULATION. (Soryo kisei no gijutsuteki sokumen -- Soryo kisei o kokateki no jishu suru tameno gijutsuteki shomondai). Text in Japanese. Preprint, Japan Science Council, p. 33-34, 1973. (Presented at the Domestic Symposium for International Environment Preservation Science Conference, 1st Tokyo, Japan, Nov. 8-10, 1973.)

In the existing method of total emission regulations, the pollutant concentration and contributory rate of each pollutant source are calculated using the diffusion model based on the information compiled on the emission quantity of pollutant from each pollutant source, stack height, and meteorological data such as wind velocity and direction and the emission quantity and reduction rate required to maintain a certain environmental concentration are determined. However, the estimations made by such methods often proved to be far different from the actual situation. The reasons for such discrepancies, the various assumptions used in the diffusion model, are discussed indicating the complex mechanism of diffusion governed by still unknown factors. For the effectual enforcement of total emission regulation, the mandatory reporting of pollutant emission quantity by industries, installation of total emission quantity meter at each pollutant source, and a wide range pollution monitoring system are necessary. The technical problems involved in the practice of such systems are discussed.

44498

APTIC NO. 67715

Baikov, B. K., R. S. Gildenskiold, I. M. Zrazhevskii, R. I. Onikul, and G. A. Panfilova

TEST OF THE METHOD FOR COMPUTING THE DISPERSION IN THE ATMOSPHERE OF COLD DISCHARGES ON MATERIALS FROM THE STUDY OF RAYON PLANTS. In: *Air Pollution and Atmospheric Diffusion*. (Atmosfera Diffuziya i Zagryaznenie Vozdukh). M. E. Berlyand (ed.), New York, John Wiley and Sons, 1973, p. 78-88, 5 refs. Translated from Russian by A. Baruch, Israel Program for Scientific Translations, Jerusalem.

Theoretical studies aimed at expanding the applicability of the standard method for calculating the dispersion of industrial discharges in the atmosphere in use in the USSR were carried out. A procedure was evolved and extended to a wide class of sources with cold and weakly heated discharges and with low dangerous wind velocities. The calculations were simplified by replacing the parameters of the low sources by their mean values ascribed to one source located at the center of the industrial area. The standard method for computing dispersion of cold discharges was applied to the study of plants producing viscose rayon and discharging carbon disulfide and hydrogen sulfide to the atmosphere. These studies are reviewed, and the results of the calculations are described. The calculations were confirmed by experimental studies. The calculations based on the specific balance of CS₂ and H₂S gave positive results of roughly the same order of accuracy as the calculations based on direct measurements of the discharges from the sources.

44499

APTIC NO. 67717

Braham, R. R., H. Dytch, and R. G. Knollenberg

AEROSOL MEASUREMENTS OVER ST. LOUIS. Preprint, American Geophysical Union, 7p., 1973, 3 refs. (Presented at the American Geophysical Union Meeting, Washington, D. C., April 20, 1973, Paper M25.)

The study of urban weather modification in the St. Louis area which was part of Project Metromex is discussed. The aerosols in St. Louis were measured with an aerosol spectrometer in a research airplane. The measurement equipment and results are described. Aerosol cross sections were taken at various distances from the city. Wind changes during the time required to take the data and the fact that the wind may shear with height may cause problems. The number of small particles was greater in city plumes than in rural plumes. The concentration of cloud condensation nuclei (CCN) was measured in a thermal gradient diffusion chamber. Most aerosols, in the sizes discussed, are capable of serving as CCN.

44500

APTIC NO. 67716

Braham, Roscoe R., Jr.

CLOUD PHYSICS APPROACH TO URBAN WEATHER MODIFICATION. Preprint, American Geophysical Union, 9p., 1973. (Presented at the American Geophysical Union Meeting, Washington, D. C., April 20, 1973, Paper H52.)

The first results are given of a systematic series of research steps aimed at illuminating the physical process which may be altered within clouds of an urban setting. The study was conducted as part of Project Metromex, and consisted of studying the mechanisms by which the urban-industrial complex of St. Louis modifies local and possibly regional weather. The major objectives for 1971 were to measure cloud condensation nuclei (CCN) and to determine the extent to which St. Louis acts as a source for such particles; to extend available theories to give a model for predicting the effect of CCN upon cloud drop spectra at cloud base levels; to measure the cloud base drop spectra to determine whether clouds upwind differ from those over and downwind of the city and whether any such differences could be related to CCN measurements; to map precipitation regions using a height-finder radar; and to measure the size and intensity of the thermal plume, or heat island over the city.

44501

APTIC NO. 67417

Cermak, J. E., D. J. Lombardi, and R. S. Thompson

PHYSICAL MODELING OF ATMOSPHERIC DIFFUSION. National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 37-72. 15 refs. (Aug. 8-10.)

NTIS: CONF-730802

The use of wind tunnels in modeling the atmospheric boundary layer over urban areas to determine the pollutant transport characteristics is discussed. A meteorological wind tunnel and an environmental wind tunnel were used to determine distributions of pollutant concentrations downwind of a specific source for a range of meteorological conditions of local significance. The theoretical background, a laboratory application, and laboratory techniques are discussed. The effects of city geometry upon contaminant dispersion in city streets considering turbulent and advective transport were studied in the environmental wind tunnel. Concentration measurements will be made in a real city to determine the reliability of the laboratory data.

44502

APTIC NO. 67800

Dupoux, Nicole

VARIATIONS OF THE ATMOSPHERIC AEROSOL AS A FUNCTION OF THE CHARACTERISTICS OF THE ENVIRONMENT. (*Variations de l'aerosol atmospherique en fonction des caracteristiques du milieu*). Text in French. Centre d'Etudes de Fontenay-aux-Roses (France), Dept. de Protection, Service Technique d'Etudes de Protection et de Pollution Atmospherique, Rept. CEA-R-4461, 39p., July 1973. 43 refs.

NTIS: CEA-R-4461

Variations of the atmospheric aerosol as affected by meteorological and other factors were studied. Electrically neutral and small particles appear in the atmosphere during the daytime to subsequently disappear by coagulation on preexisting particles. The aerosol concentration level and the rate of its change are affected by the overall pollution level. The fluctuations of the characteristics of the aerosol particles coincide with those of the sulfur dioxide concentration. Particles originating most probably from SO₂ are found in the atmosphere. Washout of atmospheric aerosol by rain, absorption of SO₂ by fog droplets occurs. In the presence of SO₂, the atmospheric aerosol present in fog is constituted mainly of large particles. Relationships between the presence of very small nuclei and SO₂ as well as solar radiation have been established.

44503

APTIC NO. 67713

Eliseev, V. S.

STEREOPHOTOGRAMMETRIC INVESTIGATION OF THE AIR FLOW IN THE BOUNDARY LAYER OF THE ATMOSPHERE ABOVE A HILL. In: *Air Pollution and Atmospheric Diffusion*. (Atmosferaya Diffuziya i Zagryaznenie Vozdukh) E. N. Berlyand (ed.) New York, John Wiley and Sons, 1973. p. 95-108. 19 refs. Translated from Russian by A. Baruch, Israel Program for Scientific Translations, Jerusalem.

Ground stereophotogrammetric surveys can be used to investigate the structure and diffusion characteristics of the air flow in the boundary layer of the atmosphere. Equipment was developed for the ground stereophotogrammetric survey of smoke trails, and the analytical method was used for solving the equations connecting the coordinates of the investigated targets and the coordinates of their images. The accuracy of calculations of the air speed from stereophotograms of vertical smoke trails was studied theoretically. An experimental study was conducted in the field of the air flow past a hill.

44504

APTIC NO. 67425

Gordon, G. E. and W. H. Zoller

NORMALIZATION AND INTERPRETATION OF ATMOSPHERIC TRACE-ELEMENT CONCENTRATION PATTERNS. National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 314-325. 12 refs. (Aug. 8-10.)

NTIS: CONF-730802

Atmospheric concentrations of trace elements attached to particles in an urban area vary greatly from one time to another at a given location because of changes in wind direction and other meteorological conditions. As a result of this variability, it is difficult to interpret absolute concentrations in terms of possible sources of observed elements. Much of the uncertainty can be removed by a double normalization of elemental concentration patterns, the first normalization being to a major nonvolatile element such as aluminum or silicon, and the second, to the crustal abundance pattern. This procedure reveals large enrichments of some elements in the atmosphere relative to the crustal pattern. Possible sources of these enriched elements can be identified by performing similar normalizations of elemental concentrations in particles released by major air pollution activities. (Author abstract)

44505

APTIC NO. 70024

Griggs, M.

DETERMINATION OF AEROSOL CONTENT IN THE ATMOSPHERE FROM ERTS-1 DATA (FINAL REPORT). Science Applications, Inc., La Jolla, Calif. National Aeronautics and Space Administration Contract NAS5-21860, Proposal 245, Goddard Space Flight Center ID P 135, SAI-73-625-LJ, E74-10452, CR-137441, 53p., Oct. 23, 1973. 27 refs.

NTIS: N74-21977

The radiance over water surfaces was related to the atmospheric aerosol content. The MSS channels 4, 5, and 6 centered at 0.55, 0.65, and 0.75 micron have comparable sensitivity. The aerosol content can be determined within + or - 10% with the assumed measurement errors of the MSS. The radiance aerosol content relationship can provide a basis for monitoring the atmospheric aerosol content on a global basis, allowing a base-line value of the global burden of aerosols to be established. This base-line could be established more rapidly from satellite measurements than from a network of ground based observations. This technique could provide a method for monitoring the particulate emissions of the SST's by making observations in the vicinity of flight corridors, such as over the North Atlantic. (Author summary modified)

44506

APTIC NO. 67424

Katen, Paul C.

MODELING ATMOSPHERIC DISPERSION OF LEAD FROM AUTOMOTIVE SOURCES. National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 298-313. 9 refs. (Aug. 8-10.)

NTIS: CONF-730802

Several experimental programs were conducted for the purpose of studying and parameterizing the atmospheric transport of lead from automotive sources. Short-range diffusion from an isolated, divided highway was described with a Gaussian plume model, and evaluated by a scheme to account for vertical wind profiles, yielding a non-Gaussian vertical concentration profile. Several of the modeling problems for particulate diffusion are discussed. An extensive field program was conducted to measure vertical lead concentrations in a city street canyon. Results show some very strong vertical concentration

gradients and complex flow patterns which vary significantly with wind direction. Physical modeling is presently on-going and will be compared to field results. A sampling network of 19 stations was established in and around Fort Collins, Colorado covering an area of 125 sq km. Graphite emission spectrometer cups were used as the filtering media, with filters being changed three times daily. Simple diffusion models were complicated by having to estimate source strengths and particulate settling. (Author abstract modified)

44507

APTIC NO. 67416

Patterson, M. R., J. B. Mankin, and A. A. Brooks

OVERVIEW OF A UNIFIED TRANSPORT MODEL. *National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 12-23. 5 refs. (Aug. 8-10.)*

NTIS: CONF-730802

A computer model is being developed which couples atmospheric deposition of trace contaminants to a hydrologic transport mode. This Unified Transport Model consists of two major submodels: the Atmospheric Transport Model and the Wisconsin Hydrologic Transport Model. These models are described and discussed. Physical transport, chemical exchange processes, and coupling of toxicant transport to biological uptake and food chain processes are actively being modeled. A brief summary is given of the programming considerations, coupling of the submodels, and the capabilities of the unified model. A summary of model validation studies is given along with a projection of the modeling effort during the next year. The Wisconsin Hydrologic Transport Model has been translated from Fortran V to Fortran IV and was implemented on the IBM 360 computer. The Air Transport Model was coupled to the Wisconsin Model to obtain washout coefficients, provide deposition values, and from the nucleus of the Unified Transport Model. The soil erosion process in the unified model is being reformulated, and the suspended particulates will be coupled to the Texas model for sediment exchange in the channel system. Sediment transport in the channel is being studied. Soil moisture and ground water transport is actively being developed in a finite element formulation. (Author abstract modified)

44508

APTIC NO. 67434

Peyton, T. O. and A. W. McIntosh

DISTRIBUTION OF HEAVY METALS IN A BORROW PIT. *National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 589-598. 3 refs. (Aug. 8-10.)*

NTIS: CONF-730802

Two systems, one of them a borrow pit and the other a small pond, lying along the Indiana Toll Road were used for a study of the input and distribution of cadmium, lead, and zinc in aquatic systems. The borrow pit, located in Gary, Indiana, was exposed to automotive and industrial aerial deposition; the pond, situated near Michigan City, Indiana, receives mainly automotive inputs. Initial samples from the 0-10 cm layer of sediment indicated elevated metal levels, with maximum values of 3.3 ppm Cd, 998 ppm Zn, and 493 ppm Pb in the Gary pit and 1.40 ppm Cd, 251 ppm Zn, and 126 ppm Pb in the Michigan City pond (dry-weight basis). Initial correlation coefficients between % organic matter and heavy metal concentrations in the Gary pit sediment were high. Cadmium:lead:zinc ratios in pit sediment, while similar to ratios in emissions from a nearby metal refining industry, also reflected a lead input from automotive sources. (Author abstract)

44509

APTIC NO. 67433

Pietz, R. I., J. E. Newman, and W. A. Bruns

PRELIMINARY DETERMINATIONS OF TRACE METALS IN HI-VOL PADS AND SOILS AROUND THE SOUTH END OF LAKE MICHIGAN. *National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 573-588. (Aug. 8-10.)*

NTIS: CONF-730802

Cadmium, lead, copper, and zinc were analyzed from total suspended particulate sample pads for 63 locations in northwest Indiana and Cook County, Illinois. Comparisons were made between mean daily total particulate concentrations and each of the four trace metals studies at each location for each regularly scheduled Environmental Protection Agency sampling day from Dec. 1972 to Feb. 1973. Variability in sample pad loading was compared with the individual variability of the four trace metals. Soil sampling transects were initially established in northwest Indiana during 1972 to determine if airborne trace metal particulates from the Gary-East Chicago, Indiana area were contaminating the soils of the regions. Sampling sites along the transects were selected using a constant geometric ratio. The soils collected at depths of 0-2.5 cm revealed higher levels than those taken at greater depths. Trace metal concentrations were highest in urban areas and generally decreased with distance from the urban sampling sites. The gross deposition rates on land and water surfaces were closely related to mean total particulate levels, and much of the trace metal deposition was directly related to the heaviest portion of the particulate. Thus, dry fall including dust fall was more important than rainout. Statistical correlations suggested lead was highly concentrated in areas of heavy traffic densities in both urban and rural areas, while zinc and cadmium were not. Hi-vol pad analysis may be an ineffective method for determining zinc distribution due to the background variability in hi-vol pads. Cadmium and zinc levels were not significantly higher than background levels in the regularly mixed plow layer of agricultural soils outside the Gary area. Nondisturbed surface soil and litter samples from urban, industrialized, and heavy traffic density areas contained high concentrations of Pb, Zn, and Cd. Cadmium concentrations greater than background for many litter and nondisturbed surface soil samples in remote rural areas suggested that Cd-bearing particles may be involved in rainout as well as suspended particulate washout. These results were based on preliminary results. (Author abstract modified)

44510

APTIC NO. 67796

Schattmeyer, John F. and Paul Urone

A TRACER STUDY OF METEOROLOGICAL INFLUENCE ON THE DISPERSION OF GROUND-APPLIED INSECTICIDE AEROSOLS (FINAL REPORT). *Florida Univ., Gainesville, Dept. of Environmental Engineering Sciences, Army Medical Research and Development Command Contract DADA 17-72-C-2098, Rept. APL-101, 286p., Aug. 1973. 81 refs. NITS, DDC: AD-773 653*

The dispersion of insecticide aerosols was investigated at a residential test site under a variety of nocturnal conditions. Five programmed sequential aerosol samplers were used to capture fluorescent particle traced aerosol droplets. Measurements were conducted at ground and elevated locations. Simultaneous and coincident biological measurements were performed with live caged mosquitos to assess standard rate ultra low volume applications of malathion insecticide. Meteorological measurements included vertical temperature and wind structures, atmospheric turbulence, net radiation, and reference wet and dry bulb temperatures. Twenty one test runs were conducted in North central Florida during 1972. (Author abstract modified)

44511

APTIC NO. 64173

Schiff, H. I. and J. C. McConnell

POSSIBLE EFFECTS OF A FLEET OF SUPERSONIC TRANSPORTS ON THE STRATOSPHERIC OZONE SHIELD. *Rev. Geophys. Space Physics*, 11(4):925-934, Nov. 1973. 32 refs.

The possibility that large quantities of water and various nitrogen oxides can be injected into the stratosphere by a fleet of supersonic transports (SSTs) has raised concern over the possibility of a reduction in the ozone shield. Calculating such a reduction requires knowledge of the roles of NO_x and water in the natural O₃ budget. Initially, not enough was known about the background densities of NO_x or of the rate constants involved to make quantitative statements of the effect of NO_x and H₂O and the O₃ budget. Recently many of the rate constants required in a quantitative analysis have become known. These results, incorporated into model calculations with natural sources of NO_x and observed H₂O mixing ratios, tend to indicate that these constituents play an important role in the O₃ budget in the natural stratosphere. At the same time, recent measurements of nitric oxide, nitrogen dioxide, and nitric acid have become available. The NHO₃ measurements by several different groups appear to be mutually consistent. The results of both the NO measurements and the NO₂ measurements, however, differ by an order of magnitude. Although the rate data available are not of sufficient accuracy to resolve the discrepancy between the measurements, it does appear that there will be a reduction in stratospheric O₃ caused mainly by HO_x or NO_x catalysis or both. A semiquantitative analysis for a fleet of SSTs suggests a decrease in the column density of O₃ of ~5-5%. This could cause a corresponding increase of erythral radiation in the 290- to 300-nm region reaching the ground. Since the stratosphere is also a source of tropospheric O₃, there would also be an effect on the tropospheric O₃ density. Since O₃ is the only source of O(1D) atoms required to initiate many tropospheric chemical mechanisms by its reaction with H₂O, the chemistry in the lower atmosphere would also be altered by SST operations. (Author abstract modified)

44512

APTIC NO. 67740

Shaw, John H. and C. C. Jones

HIGH RESOLUTION INVESTIGATION OF THE INFRARED TRANSMITTANCE OF LONG ATMOSPHERIC PATH LENGTHS AND OF INDIVIDUAL ATMOSPHERIC GASES (FINAL REPORT). *Ohio State Univ., Research Foundation, Columbus, Ohio, Dept. of Physics, National Oceanic and Atmospheric Administration Grant N22-201-72(G), RF Proj. 3501, Rept. 2, 84p., Sept. 1973. 6 refs.*

An atlas of absorption lines of carbon monoxide, carbon dioxide, nitrous oxide, methane, water, and HDO which appear in spectra of paths of ground level air up to 1100 m in length was prepared. This atlas covers the spectral region from 1740 to 3500 cm to the minus 1 power and most of the spectra were obtained with a spectral resolution of 0.1 cm to the minus 1 power or better. The positions of most of the observed lines agree, within experimental error, (usually 0.03 cm to the minus 1 power or better) with those contained in the AFCRL Atmospheric Absorption Line Parameters Compilation. Approximately a dozen H₂O lines show differences in position of 0.10 cm to the minus 1 power or more. Although quantitative absorbance measurements have not been made, the relative intensities of the observed lines show good agreement with those given in the compilation, with the exception of about 40 H₂O lines, most of which are associated with the 030-010 vibrational transition, which have not been observed. (Author abstract modified)

44513

APTIC NO. 67647

Smirnov, B. I. and B. N. Sergeyev

SIZE DISTRIBUTION OF LARGE CLOUD DROPS GROWN ON HYGROSCOPIC CONDENSATION

NUCLEI. *Bull. Acad. Sci., Phys. Atmos. Oceans.* (English translation from Russian of: *Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana*), 9(12):737-744, 1973. 34 refs.

The formation of a large droplet distribution on hygroscopic aerosol particles with a Junge size distribution is examined. The distribution of the large drops must follow a power law whose exponent depends on the exponent in the Junge law and on the properties of the condensation nuclei. The large drop concentration is calculated and compared with observational data. The results may be useful in constructing a theory of rain from cloud drops and for the theory of seeding with hygroscopic substances.

44514

APTIC NO. 63703

Sonobe, Yoshitaka

INVESTIGATION ON AIR POLLUTION FORECASTING-A MODEL FOR PREDICTION OF PHOTOCHEMICAL SMOGS IN YOKKAICHI. (Taiki oson yoho chosa (daiippo), Yokkaichi no kokagaku sumoggu yoho no shian). Text in Japanese. Tokyo Kanku Chihō Kishō Kenkyukai-shi (Geophys. Notes Tokyo Dist. Meteorol. Obs.), no. 6:289-290, 1973.

In Yokkaichi, 19 warnings and 4 alerts were issued for high oxidant pollution in 1972. The data were studied and analyzed for a prediction model for potential smogs. The frequency of high oxidant concentration in Middle Japan is relatively small, but the concentration tends to be high. Oxidant concentration increases with the rise of the sea wind, and the high concentration area is created in the sea breeze area rather than in the meeting area of land and sea breezes. The monthly averages of 1972 were high in April and May, and low in June and September. The daily pattern showed that the concentration began to climb about 7 am and the maximum was reached between 1 and 3 pm. The measurements at 5 pm and 10 am are about the same. The vertical concentration of oxidant increases with the altitude. In Yokkaichi, the measurements on one July day were 0.015 ppm on the fifth floor of the city hall building (15 m) and 0.030 ppm on the 12th floor (40 m). On another day, at 40 m, the night averages were 0.04-0.05 ppm, and the day time maximum was 0.144 ppm; at 15 m, the night maximum was 0.05-0.07 ppm, and the day time maximum was 0.117 ppm. On the same day, the measurement of sulfur dioxide was 0.210 ppm. A prediction model was based on the rise of sea and land breezes, prediction of wind, the sunshine, maximum temperature, visibility, stability, upper layer breeze, inversion layer, and MMD. The prediction model is presented in graphs.

44515

APTIC NO. 67436

Thomas, T. J. and W. J. Davis

MODELING OF PARTICULATES IN GARY, INDIANA AREA. *National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 326-350. 4 refs. (Aug. 8-10.)*

NTIS: CONF-730802

A survey is given of efforts to model the transport of particulates in the atmosphere of the Gary, Indiana area. An up-graded version of the Air Quality Display Model (AQDM) was used which included the addition of dust fall equations to model particulate settling and mass depletion of the plume and the addition of a curvilinear wind field to account for lake breezes. The derivation and preliminary results of these adaptations are given. The AQDM computer model was used to determine transport of cadmium in the Gary region considering the effects of Lake Michigan and dust fall. Preliminary results of the model, using total particulates as the pollutant, demonstrated that dust fall was a highly important consideration, very probably accounting for the calibration slope necessary, but unexplainable, in transport models that treat particulates as a gas. The effects of Lake Michigan, previously assumed to be large, were quite the opposite. The effects of a lake breeze were essentially self-canceling. (Author abstract modified)

44516

APTIC NO. 67792

Wendling, P. and H. H. Böle

A COMPARISON OF MEASURED AND CALCULATED TRANSMISSION SPECTRA OF THE ATMOSPHERE AT 3.9 MICRON. (Ein Vergleich gemessener und berechneter Transmissionspektren, der Atmosphäre im Spektralbereich bei 3.9 μ m). Text in German. Meteorologisches Institut der Ludwig - Maximilians - Universität, München (Germany), Bundesminister der Verteidigung Rüstungshauptabteilung Contract, Military Research Rept. BMVg-FBWT 73-11, 82p., 1973. 155 refs.

NTIS: N73-32297

An infrared grating spectrometer is described which was suitable for the measurement of atmospheric high resolution transmittance at Malsch near Munich using the sun as the source. The continuum extinction coefficient in the infrared near 3.2 μ m observed during days with different humidity and aerosol content in the atmosphere was separated by using regression analysis. The selfbroadened and foreign broadened component of the water vapor continuum, the part of absorption due to carbon dioxide and nitrogen, and the contribution of aerosol extinction were analyzed. Laboratory measurements were made and are in good agreement with the calculated measurements of a height constant nitrous oxide volume mixing ratio of 0.30 (plus or minus 0.03) times 10 to the minus 6th power.

44517

APTIC NO. 67795

Westwater, E. R., J. B. Snider, A. V. Carlson, and J. R. Yoder
EXPERIMENTAL DETERMINATION OF TEMPERATURE PROFILES BY GROUND-BASED RADIOMETRY. National Oceanic and Atmospheric Administration, Boulder, Colo., Environmental Research Labs., NOAA Tech. Rept. ERL 289-WPL 27, 104p., Dec. 1973. 42 refs.

GPO

Microwave and infrared radiometers for recovering low altitude temperature profiles were investigated. The radiometers were a two channel microwave system, operating at 53.5 and 54.5 GHz, and a four channel infrared system, operating near 15 μ m. For these frequencies and in the troposphere, water and carbon dioxide are the major contributors to the transmission. Meteorological support included radiosondes, helicopters, and an instrumented 500 ft tower. Significant features of thermal inversion structure were recovered. The statistical inversion method and the Backus-Gilbert method were applied to the analysis of the accuracy and the spatial resolution of the ground-based system. (Author abstract modified)

44518

APTIC NO. 67728

Wyckoff, R. J., D. W. Beran, and F. F. Hall, Jr.

A COMPARISON OF THE LOW-LEVEL RADIOSONDE AND THE ACOUSTIC ECHO SOUNDER FOR MONITORING ATMOSPHERIC STABILITY. J. Appl. Meteorol., 12(7):1196-1204, Oct. 1973. 18 refs.

Temperature profiles measured with a radiosonde were compared with returns from an acoustic echo sounder throughout the height range of 50-7000 m. In general, the sounder records indicated the temperature inversion to be somewhat lower than the radiosonde records. The reasons for this apparent discrepancy and the advantages of the sounder, in being able to monitor continuously the inversion structure and undulations produced by wind shear, are discussed. It was feasible to operate the acoustic sounder in a noisy commercial district with little detrimental effect on the ability to detect atmospheric temperature structure. The combination of the radiosonde and the acoustic echo sounder provides a much more valuable tool for monitoring structure in the stable planetary boundary layer during urban air pollution episodes than either device used alone. (Author abstract modified)

44519

APTIC NO. 67714

Zaitsev, A. S.

WIND DIRECTION FLUCTUATIONS IN THE BOUNDARY LAYER OF THE ATMOSPHERE. In: Air Pollution and Atmospheric Diffusion. (Atmosferaya Diffuziya i Zagryaznenie Vozdukha). M. E. Berlyand (ed.), New York, John Wiley and Sons, 1973. p. 109-112. 7 refs. Translated from Russian by A. Baruch, Israel Program for Scientific Translations, Jerusalem.

Wind direction fluctuations are a very important characteristic in a study of the diffusion of contaminants from different types of sources. Frequent basic pilot balloon observations were carried out during a study of the propagation of discharged gases from the Balakovo synthetic fiber plant in July-August 1967. The wind characteristics were calculated on a computer, wind direction and mean square deviation were calculated, and the accuracy of the calculations of the wind direction was determined. The measurements were compiled to give a diurnal profile of the scatter of the wind direction in the boundary layer. An analysis of the dependence of the scatter in wind direction on the wind speed showed a clear decrease in the mean square deviation with increase in the wind speed. Analysis showed that the existing dependence on the wind direction is rather connected with the overall synoptic situation during the period the experimental studies are carried out.

1972

44520

APTIC NO. 67489

Fisher, N. W. F. and P. M. J. Fisher

AUTOMOTIVE AIR POLLUTION IN URBAN ROAD SYSTEMS: A CONTRIBUTION TO THE ANALYSIS. Aust. Road Res. Board, Proc. Conf., 6th, 6(2):404-436, 1972. 21 refs.

Various relationships that determine the emissions of motor vehicle pollutants, the dispersal of these emissions into the atmosphere, and the levels of these pollutants in urban areas are outlined, with the relationships being formulated into a model appropriate for systems analysis. The model used is known as COMUPA (Computerized Model for Urban Pollution from Automobiles) and consists of two main components. An emission production sub-model calculates emission volumes in each area as a function of average vehicle route speed and traffic volumes, while a diffusion sub-model calculates the concentration of a pollutant in each area as a function of emission volumes in that area and each other area and meteorological information on wind speed, direction, and frequency. The model is applied to the city of Melbourne for the pollutant carbon monoxide and is used to predict the growth in CO production to 1981, the effects of road system improvements, the effects of city meteorology, and the effects of urban form.

44521

APTIC NO. 67718

Hirono, M., M. Fujiwara, O. Uchino, and T. Itabe

OBSERVATIONS OF AEROSOL LAYERS IN THE UPPER ATMOSPHERE BY LASER RADAR. Rep. Ionos. Space Res. Jap., 26(4):237-244, Dec. 1972. 13 refs.

A laser radar (lidar) was used at Fukuoka for studies of upper atmospheric densities and aerosol concentrations to an altitude of 40 km. This was the first laser sounding of the stratosphere in southwest Japan. For the period Oct.-Nov. 1972, aerosol layers were found at heights between 15 and 30 km, and the lower peak was found at several km above the tropopause. Comparison of the profiles of the layer with those obtained at other stations showed systematic variations against latitude which may be produced by the influence of the general circulation in the atmosphere. The appearance of a peak of the layer at the height of about 27 km on early days and its decrease followed by downward motion suggested that a part of the dust of the comet Giacobini-Zinner took a week to fall from the top of the atmosphere to about 27 km. If the radius of the meteoric dust was about 10 μ m and its density on

the order of 1 g/cu m, a week was the estimated falling time. Such an interpretation seems reasonable. Further observation is still necessary to confirm this interpretation, since the period of observation is too short to compare the irregular features with the quiet profiles. (Author abstract modified)

44522

APTIC NO. 67743

Huang, Chin-hua and E. C. Nickerson

NUMERICAL SIMULATION OF WIND, TEMPERATURE, SHEAR STRESS AND TURBULENT ENERGY OVER NONHOMOGENEOUS TERRAIN. Colorado State Univ., Fort Collins, Fluid Dynamics and Diffusion Lab., Office of the Naval Research Contract N00014-68-A-0493-001, Proj. NR 062-414/6-68(Code 438), CER71-72CH-ECN23, THEMIS-TR-12, 283p., March 1972. 108 refs.

Airflow in the atmospheric surface layer over nonhomogeneous surfaces with discontinuities in surface roughness and temperature was investigated by numerical techniques. A computational scheme was developed for solving the steady state two-dimensional boundary layer equations. Several theorems of convergence are proved. A successful numerical test, which was compared to the exact solution, was achieved. The numerical results of velocity and shear stress are compared with wind tunnel and field data. The roughness and temperature discontinuities effect upstream and downstream flow conditions. Significant variations in the horizontal velocity, vertical velocity, and shear stress profiles near the roughness discontinuity occurred between those cases neglecting and those retaining the pressure terms in the governing equations. The predicted physical quantities for diabatic conditions show significant differences in those two cases. (Author abstract modified)

44523

APTIC NO. 67744

Schiermier, Francis A.

LARGE POWER PLANT EFFLUENT STUDY (LAPPES). VOLUME 4 - INSTRUMENTATION, PROCEDURES, AND DATA TABULATIONS (1971) AND PROJECT SUMMARY. Environmental Protection Agency, Research Triangle Park, N. C., Office of Administration Pub-APT 1143, 296p., Nov. 1972. 38 refs.

NTIS: PB 230050

The extent and effects of air pollution resulting from the largest complex of coal burning generating stations in the United States was evaluated through the Large Power Plant Effluent Study (LAPPES) which was initiated during 1967 in western Pennsylvania. During 1971, two series of LAPPES field experiments were conducted in areas surrounding the Conemaugh and Keystone Generating Stations. These experiments consisted of ground based and airborne plume measurements supported by extensive meteorological observations. The topography and climatology of the generating station complex, the sulfur dioxide and meteorological monitoring equipment, and experimental procedures are described. Plant operational parameters and the air quality and meteorological data collected during 1971 are tabulated. The entire LAPPES project is summarized and includes series tabulations of air quality and meteorological data collected from 1967-1971 and descriptions of contractor participation and the LAPPES vegetation study. (Author abstract modified)

44524

APTIC NO. 67791

Whelpdale, D. M.

THE CONTRIBUTION MADE BY AIR-BORNE POLLUTANTS TO THE POLLUTION OF LARGE BODIES OF WATER. *Atmosphere*, 10(1):18-22, 1972. 5 refs.

The pollution of large bodies of water by airborne pollutants is discussed. Twenty five percent of pesticides and 50% of heavy metals such as lead reaching the oceans are contributed by atmospheric sources. The chemical composition and low buffering capacity of freshwater bodies makes them susceptible to

AIR POLLUTION ABSTRACTS, FEBRUARY 1975

more potential pollutants such as sulfur dioxide, nitrogen, and phosphorus. Pollutants enter the water directly from precipitation scavenging and dry deposition or indirectly from surface run-off and ground-water. The scarcity of direct measurements of atmospheric pollutants contributions to the pollution of large bodies makes it difficult to establish pollutant budgets for specific substances and specific bodies of water. The Canadian Atmospheric Environment Service is investigating airborne pollution of water including the measurement of vertical fluxes of ozone, carbon dioxide, and sulfur dioxide of a lake.

44525

APTIC NO. 63993

DUST. In: *Patterns and Perspectives in Environmental Science*, p. 191-194, 1972.

GPO

African dust is being transported to the Western hemisphere, with resultant effects interrelating these dust outbreaks and hurricanes. The dust's ability to directly influence hurricanes lies in its ability to directly influence the thermodynamics of cloud growth through its role as an ice or condensation nucleus. Dust can serve as a tracer of atmospheric air motion. Quantitative measurements of windborne dust transport show that loading is highly variable from day to day, season to season, and year to year. Direct measurement is needed to assign a cause to the outbreak or to detect the variation of dust loading downwind from Africa. There is an abrupt change in the general source region of the dust between winter and summer. From 5 to 20% of the particles are in excess of 10 micron. The dust may play some secondary role in the growth or suppression of tropical disturbances and the entire energetics of the tropical atmosphere. Aerosol and dust measurements made by aircraft in the vicinity of African disturbances will provide more detailed knowledge of the vertical distribution of dust and other aerosols. Dust traces air motions in the trade winds, thereby leading to an understanding of the dynamics of air motion. Temperature, stability, and water-vapor content of the air is singularly different in the dusty area. Chemical, mineralogical, and color analysis of the dust is a possible method for determining the origin, composition, and seeding possibilities of the dust. Radon-222 measured in the high troposphere may be useful in tracing the outflow of dusty air from the tops of cumulonimbus and can substantiate the theory of high concentrations of ice nuclei and dust particles sometimes found in the upper atmosphere of the territorial region. LINDAR is another indirect method for estimating the vertical distribution of dust, which measures the back scatter from a laser beam. More useful than LINDAR is the measurement of turbidity from photometric measurements of skylight distribution and spectral attenuation of solar radiation.

1971

44526

APTIC NO. 64237

Mitchell, J. Murray, Jr.

THE GLOBAL COOLING EFFECT OF INCREASING ATMOSPHERIC AEROSOLS: FACT OR FICTION? Preprint, World Meteorological Organization, Geneva (Switzerland) and International Assoc. of Meteorological and Atmospheric Physics (Ontario), 22p., 1971. (Presented at the WMO/IAMAP Symposium Physical Dynamic Climatology, Leningrad, USSR, Aug. 16-20, 1971.)

The theoretical role of atmospheric particles in affecting the mean temperature of the earth atmosphere system is examined. Some fundamental considerations are given as to the manner in which aerosols interact with solar radiation to the formulation of some alternative models of the global heat budget in which allowances are made for various possible interactions of aerosols with global cloudiness. Six environmental models are proposed for distinguishing between a net cooling and a net warming effect on climate associated with an in-

creased particle loading of the atmosphere. Four of the models take into account various possible feedback effects of aerosols on global cloudiness and on the contribution of clouds to the planetary albedo. A net cooling effect of increasing aerosols is not to be assumed unless the added aerosols are known to be appreciably less efficient as absorbers of solar radiation than as backscatterers. Based on a very small number of available measurements on man made aerosols, such aerosols appear to possess absorption efficiencies of sufficient magnitude to place them in the category of ambiguous climatic responses. Further measurements on real aerosols, both natural and man made, are needed. (Author abstract modified)

44527

APTIC NO. 67505

Mitchell, J. Murray, Jr.

THE EFFECT OF ATMOSPHERIC PARTICLES ON RADIATION AND TEMPERATURE. In: *Man's Impact on the Climate*. William H. Matthews, William W. Kellogg, and G. D. Robinson (eds.), Cambridge, Mass., MIT Press, 1971, p. 295-301. 6 refs.

The role of atmospheric particles as scatterers and absorbers of radiation passing through the atmosphere is reviewed in relation to the radiative flux divergence field and the temperature distribution in the atmosphere. The net effect of the presence of an aerosol may be either to heat or to cool the earth's atmosphere, depending on the relative magnitudes of absorption and backscattering, with the former responsible for heating and the latter for cooling. Modified equations of the Charlson-Pilat model show that for relatively dry surfaces (deserts and urban areas), the net sensible heating effect of an aerosol is positive (warming) only if the absorption by the aerosol is equal to or larger than the backscatter by the aerosol. On the other hand, the equations indicate that for relatively moist surfaces (especially oceans and snowfields), the net effect of aerosol is positive even when the absorption is a very small fraction of the backscatter. Situations involving stratospheric aerosols or high tropospheric aerosol layers are different from those involving lower atmospheric aerosols in that surface climate is likely to be cooled regardless of the magnitude of the absorption in the aerosol layer itself.

1962

44528

APTIC NO. 63481

Friedlander, S. K.

THE SIMILARITY THEORY OF THE PARTICLE SIZE DISTRIBUTION OF THE ATMOSPHERIC AEROSOLS. Czechoslovak Academy of Sciences, Aerosols, Phys. Chem. Appl., Proc. Nat. Conf. 1st, Liblice, Czechoslovakia, 1962, p. 115-130. 17 refs. (Oct. 8-13.)

Remarkable similarities were observed in the shapes of size distributions of atmospheric aerosols measured at widely different places and times. The mechanisms of particle combination which may produce these similarities are discussed, including Brownian motion, sweepout by sedimentation, and coagulation in a shear field. Using data from the literature, it is shown that three separate ranges of the distribution determine the total number concentration, the total volumetric concentration, and the volumetric sedimentation flux. A mathematical form for the distribution function, based on dimensional considerations, can be used to describe the similarities. The form is written in terms of two characteristic scale factors which can be evaluated by using the definitions of volumetric concentration and volumetric sedimentation flux. When similarity exists, the entire size distribution can be obtained from experimental measurements of volumetric concentration of flux alone. The kinetics of combination and sedimentation, the effects of steady state, the subranges of the particle size distribution, the similarity form of the distribution function, comparison of the data of Woodcock, and the general similarity for the upper end of the distribution are discussed. (Author abstract modified)

44529

APTIC NO. 63582

Podzimek, J. and I. Cernoch

SURVEY OF FLIGHT MEASUREMENT OF CONCENTRATIONS OF GIANT CHLORIDE AND SULPHATE CONDENSATION NUCLEI. Czechoslovak Academy of Sciences, Aerosols, Phys. Chem. Appl., Proc. Nat. Conf. 1st, Liblice, Czechoslovakia, 1962, p. 553-558. 10 refs. (Oct. 8-13.)

The problems connected with the influence of temperature inversions in the vertical distribution of the concentrations of particles and the filtration effect of clouds on giant condensation nuclei are presented. The concentration distributions support the conception of the division of the lower levels of the troposphere into a surface boundary layer and the Earth's boundary layer. Direct measurements of the spectra of sulfate nuclei confirm the fact that the concentration of giant sulfate nuclei is smaller and the spectra narrower. Since the function of the size distribution is the same in different levels, the curve of the concentration can be generally valid for a certain size of particles. Parameters affecting the atmosphere are pressure, temperature, air composition, air density, and stability of atmospheric layers. A change in the density of particles may result in a greater decrease in the concentration of particles with height. Clouds have a filtration effect on the measurement of the concentration of giant hygroscopic condensation nuclei, this being a filtration effect of a cloud caused by the growth of condensation nuclei at considerable air humidity beneath the cloud layer.

1957

44530

APTIC NO. 67444

Schultz, Harvey A.

MEASUREMENT OF CONCENTRATIONS OF GASEOUS HALIDE TRACERS IN AIR BY POSITIVE ION EMISSION TECHNIQUES. Anal. Chem., 29(12):1840-1842, Dec. 1957. 10 refs.

The use of dichlorodifluoromethane (Freon 12) as a tracer for atmospheric diffusion studies is discussed in terms of modifications of ionization-type leak detectors necessary to achieve quantitative measurement of the tracer. A halogen leak detector for measurement of the halogenated hydrocarbon is modified as follows: the electrodes are removed from their ceramic ring and mounted in a massive brass enclosure to minimize holdup and bypassing of the gas stream and to minimize room temperature fluctuations; a thyatron control circuit is used to provide constancy of filament temperature; flow meters, a dust filter, and a water vapor trap are added to the gas handling equipment; hydrogen is added continually for calibration purposes; and aged electrodes are employed. Field test results indicate that the method can be used to obtain quantitative results for concentrations as low as 0.1 ppm. Dichlorodifluoromethane is an odorless, colorless gas which is noncorrosive and nontoxic in the concentrations that are required for its use as a tracer.

BASIC SCIENCE AND TECHNOLOGY

1974

44531

APTIC NO. 67932

Arikawa, Yoshiko

MECHANISM OF DECOMPOSITION AND OXIDATION OF SULFUROUS IONS. (Aryusan ion no henshitsu). Text in Japanese. Niho Joshi Daigaku Kiyo, Kaseigakubu (J., Home Econ. Dept., Japan Women's Univ.), no. 21, 127-131, Sept. 1974. 5 refs.

The rate and mechanism of decomposition and oxidation of sulfurous ions (sulfite) in aqueous solutions of 0.01 and 0.0001 mole/l were investigated for different pH values using appropriate buffer solutions. Solutions were buffered for pH values of 4, 7, and 10; additionally, a 1 N hydrochloric acid solution was employed to provide a very low pH solution. The time variation of the concentration of remaining sulfite was measured by iodometry for the 0.01 M solution and by spectrophotometry for the 0.0001 M solution. Sulfites and dithio ions formed were determined as barium sulfate by gravimetry. The rate of oxidation of sulfites to sulfuric ions was increased in the 0.01 M solution as pH increased, while in the low pH solution sulfurous acid decomposed to form sulfur dioxide which escaped into the air. No dithio ions were detected for any pH values. Sulfites were relatively stable in the 0.0001 M solution at pH 4. The mechanisms of degeneration of sulfurous ions seemed to fall into three types: decomposition only in the 1 N HCl solution, both decomposition and oxidation in the pH 2 solutions, and oxidation only in the solutions above pH 4.

44532

APTIC NO. 67582

Asaba, Tetsuro

FORMATION AND REACTION OF NITRIC OXIDE AT HIGH TEMPERATURES. (Koon ni okeru sanku chisso no seisei to hanna). Text in Japanese. Kagaku Kogyo (Chem. Ind.), 25(10):1135-1144, Oct. 1974. 34 refs.

A discussion of the formation of nitrogen oxides and the decomposition of nitric oxide at high temperatures is presented. The most basic process in the formation of NO is the mechanism proposed by Zeldovich. Oxygen in air is first decomposed to 2 atomic oxygen, which reacts with nitrogen molecules. The reaction products are NO and N, which reacts with O₂ to give NO and O. Thus a chain mechanism is completed. When the oxygen to fuel ratio decreases, the oxygen content after the end of combustion decreases. This decrease causes the reaction between N and O₂ to slow down. In this case, OH radicals react with N to give NO and H. The origin of N for the formation of NO by combustion is not limited to the air. Nitrogen atoms in fuels also form NO by combustion. Basic substances such as pyridine and quinoline and non-basic substances such as indol and pyrrol contain N atoms. These N atoms in organic substances are weakly bound with the molecules and are more active than the N atoms in N₂. It is well known that these N atoms give NO with a high yield by combustion, but little is known on the mechanism of the reaction, except that nitrogen compounds give cyanides at first in flames. The decomposition of NO at high temperatures is explained by the reverse mechanism of Zeldovich. Reactions with hydrogen and hydrocarbons possibly contribute to the decomposition.

44533

APTIC NO. 67906

Carlsson, D. J., T. Suprunchuk, and D. M. Wiles

THE QUENCHING OF SINGLET OXYGEN (1 DELTA G) BY TRANSITION METAL CHELATES. Can. J. Chem., 52(22):3728-3737, Nov. 15, 1974. 31 refs.

Various transition metal chelates quenched singlet oxygen (102) in the liquid phase. Singlet oxygen was generated either photochemically, thermally from an ozonide, or with a microwave source, and reacted with rubrene or 3-methyl-2-pentene. Rate constants for 102 quenching by the chelates were measured in various solvents using the three 102 sources, and compared with the constants of previously known 102 quenchers. The most efficient chelates quenched 102 at close to the diffusion controlled rate, as did beta-carotene. Some quenchers of 102 in the liquid phase were qualitatively shown to quench in the solid state. The possible 102 quenching mechanisms of the chelates are discussed. (Author abstract)

44534

APTIC NO. 64359

Cook, R. L. and R. W. Tock

AQUEOUS MEMBRANES FOR THE SEPARATION OF GASEOUS MIXTURES. Separ. Sci., 9(3):185-193, 1974. 15 refs.

Gas mixture separation characteristics of aqueous sulfonated film membranes were studied. Permeation constants of carbon dioxide, oxygen, ethane, nitrogen, helium, and propane through aqueous films of 2 wt% Ivory Liquid and of 2 wt% Duponol WN were determined. Binary gas mixtures of carbon dioxide-nitrogen and carbon dioxide-propane were enriched in one of the components using a thermally induced driving force. The theoretical and experimental results of the permeation parameters are discussed. (Author abstract modified)

44535

APTIC NO. 67608

Cox, R. A.

THE PHOTOLYSIS OF NITROUS ACID IN THE PRESENCE OF CARBON MONOXIDE AND SULPHUR DIOXIDE. J. Photochem., 3(4):291-304, Nov. 1974. 24 refs.

The effect of carbon monoxide and sulfur dioxide on the rate of photolysis of part per million concentrations of gaseous nitrous acid in nitrogen-oxygen mixtures was studied. The photolyses were conducted at atmospheric pressure and room temperature (294 + or - 2 K) in a flow system. The results gave information on several competing reactions of the hydroxyl radical which is produced by photodissociation of nitrous acid. Rate constants for the reactions: hydroxyl + nitric oxide + M equals HNO₂ + M (1), (M equals N₂ + O₂ at 1 atm); OH + HNO₂ equals water + nitrogen dioxide (3); and OH + SO₂ + M equals sulfurous acid + M (7) relative to the rate constant for OH + CO equals carbon dioxide + hydrogen were determined. Based on a literature value of k₆ equals 1.5 times 10 to the -13th power cu cm/molecule/sec, the values obtained were k1(M) equals 6.1 + or - 1.1 times 10 to the -12th power, k3 equals 2.2 + or - 0.2 times 10 to the -12th power, and k7(M) equals 6.0 + or - 0.8 times 10 to the -13th power in cu cm/molecule/sec units with (M) equal to 1 atm N₂ + O₂. Comparison of the data for reactions (1) and (7) with those obtained at low pressures shows that both reactions are in the pressure dependent region below 1 atm. Some implications of these results on the chemistry of SO₂ and HNO₂ in the lower atmosphere are briefly discussed. (Author abstract modified)

44536

APTIC NO. 67723

Dilmore, J. A. and W. Rohrer

NITRIC OXIDE FORMATION IN THE COMBUSTION OF FUELS CONTAINING NITROGEN IN A GAS TURBINE COMBUSTOR. Preprint, American Society of Mechanical Engineers, New York, 11p., 1974. 31 refs. (Presented at the American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Zurich, Switzerland, March 30-April 4, 1974, Paper 74-GT-37.)

Fuels containing chemically bound nitrogen were burned in a 6-inch diameter gas turbine combustor, and the nitrogen oxide production was correlated to the nitrogen content of the fuel over a range of air equivalence ratios. The bound nitrogen content varied from 0.0079% (79 ppm) to 0.79% by weight. Inlet air temperatures of 200 and 600 F were used, and outlet temperatures were varied from 1100 to 1800 F. Exhaust gases were continuously monitored, and the carbon monoxide, carbon dioxide, nitric oxide, and hydrogen concentrations were measured. The NO, normalized NO, CO, and HC concentrations and % conversion versus combustor outlet temperature were determined. Also, results from a diesel oil containing 0.13% artificially added nitrogen were compared to those from a crude oil having 0.13% naturally occurring nitrogen. The crude oil having naturally occurring fixed nitrogen produced slightly less NO than the diesel oil. (Author abstract modified)

44537

APTIC NO. 67603

Dodge, M. C. and T. A. Hecht

RATE CONSTANT MEASUREMENTS NEEDED TO IMPROVE A GENERAL KINETIC MECHANISM FOR PHOTOCHEMICAL SMOG. Preprint, Environmental

Protection Agency, Research Triangle Park, N. C. and Systems Applications, Inc., San Rafael, Calif., 19p., 1974. 3 refs.

The extent to which uncertainties in rates of reaction influence the predictions of a general kinetic mechanism for photochemical smog was investigated. An ad hoc index was formulated to reflect the importance of obtaining more accurate values of rate constants in order to increase the reliability of the mechanism. The sensitivity values can be used quantitatively to facilitate model evaluation. They can also be used to establish weighting factors for regression analyses or linear programming studies that optimize the agreement between predictions and experimental data by perturbing rate constants within their bounds of uncertainty. (Author abstract modified)

44538

APTIC NO. 67904

Elder, J. C., H. J. Ettinger, and R. Y. Nelson

CHAMBER STUDIES OF VISIBILITY-REDUCING AEROSOLS. *Atmos. Environ.*, 8(10):1035-1048, Oct. 1974. 19 refs.

Interest in light scattering measurements as an index of aerosol mass concentration in the atmosphere and concomitant degradation of visibility prompted a laboratory study to define the ratio of mass concentration to particulate light scattering coefficient (M/b sub sp) for several individual aerosols. Simultaneous measurement of b sub sp with an integrating nephelometer and M with a suitable gravimetric technique provided the basic data. Several size distributions of fly ash, coal dust, and silica dust were generated under laboratory conditions into a 16 cu m chamber, and the resulting M/b sub sp ratio compared on the basis of each aerosol's size characteristics and similar data from field studies performed by others. The M/b sub sp values for the three individual aerosols were larger than those found in previous field studies, probably due to the relatively smaller numbers of particles in the optically active size range. A significant effect of particle size on M/b sub sp was observed for the coal dust test aerosol. The M/b sub sp for an 0.70 micron count median diameter aerosol was 2.5 times the M/b sub sp for a 0.33 micron aerosol. (Author abstract modified)

44539

APTIC NO. 67675

Huebert, Barry J.

COMPUTER MODELLING OF PHOTOCHEMICAL SMOG FORMATION. *J. Chem. Educ.*, 51(10):644-645, Oct. 1974. 3 refs.

An interactive computer program was written to simulate the formation of photochemical smog under a variety of conditions. It was used in environmental chemistry courses as an example of modelling, as a vehicle for teaching chemical dynamics, and as a demonstration of some of the factors which affect the production of smog. It was written primarily for students majoring outside the natural sciences, but has also been used successfully with beginning chemistry and biology majors. The basis of the program is a 15 reaction simplified photochemical smog mechanism proposed by Hecht and Seinfeld. Input includes the selection of one of three hydrocarbons (propylene, isobutylene, and n-butane), the rate constants and stoichiometric coefficients appropriate for the chosen hydrocarbon, either sunny or cloudy conditions, and the starting concentrations of nitric oxide, nitrogen dioxide, carbon monoxide, and the hydrocarbon. (Author abstract modified)

44540

APTIC NO. 67648

Japar, S. M., C. H. Wu, and H. Niki

RATE CONSTANTS FOR THE REACTION OF OZONE WITH OLEFINS IN THE GAS PHASE. *J. Phys. Chem.*, 78(23):2318-2320, Nov. 7, 1974. 12 refs.

Bimolecular rate constants for 17 gas-phase ozone-olefin reactions were determined by monitoring the ozone decay with the nitric oxide-ozone chemiluminescence technique. The constants derived ranged from 1.9 times 10 to the -18th power cu

cm/molecule/sec for ethylene to 1.5 times 10 to the -15th power cu cm/molecule/sec for 2,3-dimethyl-2-butene. The reported rate constants probably are the true primary bimolecular rate constants for the ozone-olefin reactions. This kinetic study of the ozonolysis of olefins can be used to explain the reactions in the formation of photochemical smog. (Author abstract modified)

44541

APTIC NO. 67884

Japar, S. M., C. H. Wu, and H. Niki

RATE CONSTANTS FOR THE GAS PHASE REACTION OF OZONE WITH ALPHA-PINENE AND TERPINOLENE. *Environ. Letters*, 7(3):245-249, 1974. 10 refs.

Rate constants for the gas phase reactions of ozone with the complex olefinic hydrocarbons alpha-pinene and terpinolene, both terpenes, are reported and discussed in relation to previously reported values for such reactions. The observed rate constants for alpha-pinene and terpinolene, 3.3 times 10 to the minus 16 and 7.3 times 10 to the minus 16, respectively, are among the largest reported for gas phase ozone-olefin reactions. The fact that the terpinolene rate is twice that of alpha-pinene can be explained by the tetrasubstituted double bond in terpinolene as compared to the trisubstituted double bond in alpha-pinene. Previous work has demonstrated that each additional substituent present on the olefinic double bond under attack leads to a pronounced increase in the ozone rate constant. The observed data also indicate, presumably, that molecular oxygen quenches some type of secondary reaction which is capable of consuming ozone in the system. Although the absence of oxygen apparently allows secondary reactions to enhance the removal of ozone, it appears that oxygenated intermediates formed in the presence of air play a crucial role in the formation of aerosol in the ozonolysis of terpenes.

44542

APTIC NO. 67581

Jinno, Hiroshi

FORMATION OF NITRIC OXIDE IN FLAMES. (*Honoo ni okeru chisso sankabutsu no seiei hannon*). Text in Japanese. *Kagaku Kogyo (Chem. Ind.)*, 25(10):1128-1134, Oct. 1974. 14 refs.

The formation of nitrogen oxides in pre-mixed flames, the mechanism of formation of NO, and the elementary reactions related with NO formation are discussed. Two origins are known for the nitrogen oxides formed by combustion. One originates in the nitrogen in air, and the other originates in the nitrogen in fuels. Although the latter nitrogen forms nitrogen oxides in a higher yield than the former, this article mostly concerns the behavior of nitrogen in air during combustion. The gas formed directly by combustion is NO and not nitrogen dioxide. According to Zeldovich, N2 in air reacts with O to form NO and N. Then O2 reacts with this N to form NO and O, which completes a chain mechanism. The first O is supplied by the thermal decomposition of O2 in air. The heat of formation of NO is 21.6 kcal/mol at about 2000 K. The theory of Zeldovich agrees well with the experimental results, especially at the downstream of the flames. However, various radical overshoots, which cannot be directly explained by the hypothesis of Zeldovich, are known. More than 10 elementary reactions were considered for the reactions in the H2-O2-N2 system. Simulation experiments were performed for various elementary reactions.

44543

APTIC NO. 67533

Kopczynski, S. L., R. L. Kuntz, and J. J. Bufalini

REACTIVITIES OF COMPLEX HYDROCARBON MIXTURES. Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., 34p., June 1974. 26 refs.

Complex hydrocarbon mixtures were reacted for several hours in the presence of nitrogen oxides in a large ultraviolet irradiation chamber. The hydrocarbons were reacted at concentrations of 5, 10, and 20 ppm C in mixes containing 1/2 or 1 ppm

NO_x. Rates of oxidation of nitric oxide, nitrogen dioxide dosage, hydrocarbon consumption, eye irritation, and yields of peroxyacetyl nitrate (PAN), formaldehyde, and oxidant were measured. If aromatics are substituted for olefins in a hydrocarbon mixture, there is a decrease in both oxidant and PAN dosages. Eye irritation increased with increasing aromatics. These reactivity parameters decreased by replacing aromatics with paraffins. (Author abstract modified)

44544

AFTIC NO. 67463

Mazziotti, Alexander

INTERMOLECULAR BASIS OF ODOUR. *Nature* (London), 250(5468):645-646, Aug. 23, 1974. 6 refs.

Evidence is presented which correlates odor quality and thresholds with the depth of the intermolecular potential energy well formed between the odor-producing molecule and the unknown receptor site. There is a relationship between the depth of the pairwise intermolecular potential energy well and the normal boiling point of a substance; the depth of the well increases linearly with the boiling point. The negative derivative of this potential with respect to intermolecular separation is a measure of the electronic interactive force. In the case of the interaction of a molecule with the receptor site, the depth of the potential well will depend on the nature of the charge distribution of the odorant molecules. If only one basic type of receptor site is assured, with numerous formal charges, then a correlation should be possible between the normal boiling point of a molecule and its odor type. Normal boiling points were found for 253 ethereal, camphorous, minty, almond, aromatic, floral, and musk compounds. A better correlation is achievable if boiling points of compounds with the same functional group are classified separately. Saturated halides are listed in terms of increased boiling points. The negative log of the odor threshold concentration is computed for a series of saturated alkanes and compared with experimental values.

44545

AFTIC NO. 67657

Sandoval, H. L., R. Atkinson, and J. N. Pitts, Jr.

REACTIONS OF ELECTRONICALLY EXCITED O(1D) ATOMS WITH FLUOROCARBONS. *J. Photochem.*, 3(4):325-327, Nov. 1974. 15 refs.

Commercial fluorocarbons are currently being released into the atmosphere at rates of approximately 6.5 times 10 to the 5th power tons/yr, and their tropospheric sinks are of considerable interest. They appear to be chemically inert in the troposphere and are used as tracers of man's activities and of global atmospheric motion. It has been postulated that vertical transport of fluorocarbons to the stratosphere with subsequent photodissociation there could lead to ozone destruction via a chloride-ozone chain, analogous to the nitric oxide-ozone chain. The reactions of electronically excited oxygen atoms (O(1D)) with fluorocarbons were therefore studied for both fundamental interest and because of the possible stratospheric implications. In all cases, appreciable reaction of the fluorocarbons was observed. Control runs in which the fluorocarbon alone was irradiated showed no loss of fluorocarbon. The addition of up to 180 torr of carbon dioxide, an efficient quencher of O(1D) atoms, markedly decreased the fluorocarbon loss and product formation rates; the addition of 100 torr of helium, a very inefficient quencher of O(1D) atoms, had no observed effect. These observations confirmed that the reactions observed are due to O(1D) atoms. Experiments were carried out on the determination of reaction rate constants relative to nitrous oxide. If significant vertical transport occurs, in addition to a possible stratospheric sink of fluorocarbons by photodissociation in the wavelength region of 1750-2000 Å, the reaction with O(1D) atoms could be a further loss process in the stratospheric region above approximately 20 km.

82

44546

AFTIC NO. 67584

Sano, Taeko

TRANSPORT PROPERTIES OF BURNED GAS MIXTURE. *Tokyo Univ. (Japan), Inst. of Space and Aeronautical Science, Rept.*, 504, 39(1):1-20, Jan. 1974. 8 refs.

The transport properties of viscosity coefficient, thermal conductivity, and multidiffusion coefficient of the burned gas mixtures of n-octane by air were calculated by the approximate equations to the kinetic theory equations for the multicomponent gas mixtures. The transport properties of each species were calculated on the basis of the rigid-sphere potential. The collision diameters of the molecular species carbon monoxide, carbon dioxide, hydrogen, water, nitrogen, nitric oxide, and oxygen were calculated from the experimental data of their viscosity coefficients for temperatures ranging from 300 to 1273 K on the basis of the rigid sphere potential and expressed as a function of temperature. The viscosity coefficient, thermal conductivity, and binary diffusion coefficient of each species were calculated for the temperature range extrapolated from 300 to 2500 K based on the rigid sphere potential. Good agreement exists between the experimental data of transport properties and calculated results. (Author conclusions modified)

44547

AFTIC NO. 67616

Suzuki, Yoshinobu and Eiji Miyaji

ADSORPTION OF VARIOUS GASES IN THE AIR BY ADSORBENTS. (NO. 2 ON NITROGEN DIOXIDE). (*Kyuchakuzai ni yoru kukichu no kakushu gasu no kyuchaku. (Dai-2-bo NO₂ ni tsuite).*) Text in Japanese. Preprint, Japan Society of Heating, Air-Conditioning and Sanitary Engineers, p. 63-66, 1974. (Presented at the Japan Society for Heating, Air-Conditioning and Sanitary Engineers Annual Meeting, Tokyo, Japan, Oct. 7-8, 1974, Paper A-16.)

The basic properties and adsorption isotherms of six adsorbents such as activated charcoal, silica gel, and metallic oxides used for the removal of nitrogen dioxide for the purpose of maintaining a clean air environment were measured. The equilibrium amount of NO₂ adsorbed, specific surface area, distribution of micro-pores and average pore radius were measured. Using the secondary electron X-ray micro-analyzer, the surface of adsorbent and adsorption of NO₂ were observed by the X-ray line analysis and area analysis methods, which indicated the effective adsorption at 15-65 micron from the surface of the adsorbent. The equilibrium amounts of NO₂ adsorbed on various adsorbent measured by the static and dynamic methods were evaluated in reference to the calculated value obtained by the extrapolation method. Multi-molecular layer adsorption was determined for NO₂ rather than mere surface adsorption without infiltration. The rates of adsorption and desorption were also measured.

44548

AFTIC NO. 67684

Takagi, Toshimi, Mitsunobu Ogasawara, Kenich Fujii, and Masahito Daizo

A STUDY ON NITRIC OXIDE FORMATION IN TURBULENT DIFFUSION FLAMES. *Combustion Inst., Pittsburgh, Pa., Proc. Int. Symp. Combust.*, 15th, Tokyo, Japan, 1974, p. 206-207. 3 refs. (Aug. 25-31.)

Characteristics of nitric oxide formation in turbulent diffusion flames were experimentally investigated along with the possibility of predicting NO formation by the Zeldovich mechanism, with special attention directed to nonequilibrium oxygen atom behavior. The experiments included measurements of radial and axial distributions of temperature, flow velocity, and concentrations of stable gas species in the flames. Nitric oxide was formed mostly in the narrow region which corresponded approximately to the flame front where the gas temperature was maximum; NO concentration profiles were flattened rapidly due to turbulent mixing. The Zeldovich

mechanism underestimated the measured NO formation rate by about one order for a hydrogen flame and by about three orders for a propane flame when the equilibrium oxygen atom concentration and observed gas temperature were used as the basis for calculations. The prediction appeared possible if the oxygen atom overshoot was taken into account for hydrogen flames, although for propane flames the observed NO formation rate was too high to be accounted for by the Zeldovich mechanism.

44549

APTIC NO. 67985

Wadden, R. A., J. E. Quon, and H. M. Hulburt

A MODEL OF A GROWING COAGULATING AEROSOL. *Atmos. Environ.*, 8(10):1009-1028, Oct. 1974. 41 refs.

A continuously reinforced aerosol, undergoing change by particle growth and coagulation and particle removal at some selected large size, is described by a number balance equation. For the steady state condition, the number balance equation was solved numerically for the distribution of particle concentrations as a continuous function of particle volume. The particle growth rate was based on rate data describing manganese(2+), iron(3+), and noncatalyzed aqueous phase conversion of sulfur dioxide (gas) to sulfuric acid (liquid). The catalyst and the H₂SO₄ were assumed to be contained in drops, which grew with acid production due to the accretion of water vapor. The number balance equation without growth was also solved. Calculations on the Mn(2+) catalyzed systems resulted in distributions which reflected detectable effects of both growth and coagulation. For sufficiently large values of particle growth rate (greater than 10 to the -10th power cu micron/min), corresponding to SO₂ concentrations of 0.1-10 ppm, the resulting distributions displayed two regions, one dominated by growth and the other by coagulation. The particle size distribution in the growth region is smaller in shape to 1/particle growth rate, while in the coagulation region the particle distribution is a straight line on a log-log plot. The shape of the input distribution did not have any effect on the shape of the calculated distribution. The neutralizing effects of ammonia on the Mn(2+) catalyzed aqueous phase reaction were also checked, and the resulting distribution had a shape similar to those at high SO₂ concentrations (10 ppm). The Fe(3+) catalyzed and noncatalyzed systems (particle growth rate less than or equal to 10 to the -12th power cu micron/min) displayed only a coagulation region. At large values of particle size distribution in the growth region, calculated distribution for all systems displayed a power law relationship between particle concentration and volume with a slope of -1.3 to -1.5. The H₂SO₄ or ammonium sulfate composition of the particles was not a function of size. (Author abstract modified)

44590

APTIC NO. 66879

Yawa, Carl L. and Jack R. Hopper

OXIDES OF NITROGEN: N₂O, NO, NO₂. *Chem. Eng.*, 8(17):99-106, Aug. 19, 1974. 134 refs.

Since the average U. S. urban concentration of nitrogen oxides in air is 20-25 times above natural atmospheric conditions, air quality standards have been established for this pollutant. Physical property data on nitrogen oxides is important for the design engineer. The physical and thermodynamic properties of nitrogen oxides, such as nitrous oxide, nitric oxide, and nitrogen dioxide, are described. These include vapor pressure, critical properties (temperature, pressure, and volume), heat of vaporization, heat capacity, density, surface tension, viscosity, thermal conductivity, and heat and free energy of formation.

44591

APTIC NO. 67563

Japan Meteorological Society

INVESTIGATION AND RESEARCH OF LARGE-SCALE EXPERIMENTAL FACILITIES FOR THE ATMOSPHERE (FINAL REPORT). (*Ogata taiki kankyo jiken shisetsu ni kansuru chosa kenkyu: saishu hokokusho*). Text in Japanese. 121p., March 1974.

Prior to the installation of large scale experimental facilities to be utilized for the atmospheric experiments for analyses of air pollution, various studies on the wind tunnel were made. The research projects included studies on the formation of the temperature zone, the formation of the speed zone, studies on the basic and supplemental apparatus, studies on measurement apparatus, wind tunnel design, design of the wind tunnel exit damper, and the design of the connecting portion between the tunnel and the measurement apparatus. The smog chamber was designed for out-of-doors and indoors; a large reaction tank of about 40 cu m was to be installed where there would be sunshine all day. A mixer and stirrer, a cooler, and an entrance-exit which could be tightly closed was to be installed. The indoor tank for more precise experiments was to be about 10 cu m, with a blacklight, a temperature adjuster, a stirring device, a cleansing device, and a drain that could be closed. Supplementary equipment such as an air pollutant synthesis device, an air cleansing device, a temperature and humidity adjuster, an emission mixture device, and a waste gas treatment device are discussed.

1973

44552

APTIC NO. 67736

Cieslik, S. and C. Muller

LINE BY LINE ABSORPTION IN THE FUNDAMENTAL BAND OF NITRIC OXIDE. (*Absorption rate par raie dans la bande fondamentale infra-rouge du monoxyde de azote*). Text in French. *Aeron. Acta*, no. 114:1-23, 1973. 11 refs.

NTIS: N74-20984

The intensity of the rotation-vibration lines in the fundamental bands at 5.3 microns of nitric oxide was studied for its application to aeronautical analysis of the atmosphere. A formula for the calculation of the integrated effective absorption cross-section per line is presented. The calculated values of the effective absorption cross-section are in good agreement with those determined experimentally by Abels and Shaw at 300 K.

44553

APTIC NO. 63434

Derlyukova, L. E., B. M. Tarakanov, V. M. Bunin, and V. I. Evdokimov

REACTION OF CALCIUM CHLORIDE WITH OXYGEN AND SULPHUR OXIDES. *Russian J. Inorg. Chem., English translation from Russian of: Zh. Neorgan. Khim.*, 18(9):1239-1242, 1973. 6 refs.

The reaction thermodynamics of calcium chloride with oxygen and sulfur oxides in the temperature range 20-850 C was investigated gravimetrically and chromatographically. In that temperature range, CaCl₂ does not react with O₂, sulfur dioxide, or with a mixture of SO₂ and O₂. In sulfur trioxide the decomposition of CaCl₂ proceeds with release of chlorine and the formation of calcium sulfate. In a mixture of SO₂ and O₂ the decomposition of CaCl₂ occurs only in the presence of a catalyst of the oxidation of SO₂ to SO₃. In the absence of diffusion retardation, the limiting stage of the decomposition of CaCl₂ is evidently the oxidation of SO₂.

44554

APTIC NO. 63642

Filippov, V. L.

CERTAIN RESULTS OF A NUMERICAL EXPERIMENTS IN SUPPORT OF SELECTION OF TRANSMISSION-FUNCTION PARAMETERS OF ATMOSPHERIC GASES FOR AN UNRESOLVED SPECTRAL STRUCTURE. *Bull. Acad. Sci. (USSR) Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk, SSSR, Fiz. Atmosfery i Okeana)*, 9(7):437-438, July 1973. 8 refs.

Results are presented from numerical experiments performed for calculation of transmission functions on optical paths with lengths between 5 and 25,000 m at ground level and at heights

of 8 and 16 km in relation to the practical solution of problems involving spectral transparency calculations of atmospheric gases. Relationships are given which involve the parameters that vary over the spectrum, the absorbing mass of the gas, and the effective pressure. A correction is applied to an equation for the transmission function based on literature information.

44556

APTIC NO. 67429

Solomon, I. J., A. J. Kacmarek, F. H. Jarke, and J. Shamir

A STUDY OF PAN-TYPE COMPOUNDS BY OXYGEN-17 NMR TECHNIQUES. *National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 440-447. 5 refs. (Aug. 8-10.)*

NTIS: CONF-730002

The structure of peroxyacetyl nitrate (PAN) and its homologues was studied with oxygen-17 neutron magnetic resonance (NMR) and infrared and Raman spectroscopy. The oxygen-17 NMR data obtained and the oxygen-17 labeled compounds were used for gaining insight into the mechanism of PAN formation and decay. The analysis of the vibrational spectra, mass spectra, and nuclear magnetic resonance spectra of the PAN and its homologues are discussed. The PAN may have $\text{CH}_3\text{C}(\text{O})\text{OONO}_2$, $\text{CH}_3\text{C}(\text{O})\text{ONO}_3$, or other structures.

44556

APTIC NO. 63629

Sowinski, E. J. and I. H. Suffet

AN APPROACH FOR STUDYING THE AIR POLLUTION POTENTIAL OF SIGNIFICANT PRODUCTS RESULTING FROM AN INDUSTRIAL PROCESS. *Preprint, Western Electric Co., Allentown, Pa., and Drexel Univ., Philadelphia, Pa., Environmental Engineering and Science Program, 3p., 1973 (7). 8 refs.*

The development of analytical methods for determining the chemical fate of diborane is reported. An experimental laboratory apparatus was designed to evaluate the chemical fate of boron hydrides and of chemical related to them, e.g., metal hydrides and organometallics. It consists of a pyrolysis system; a gas handling system including a static reactor; a gas chromatograph; three flame photometric detectors; and a mass spectrometer interfacing system. The pyrolysis of B_2H_6 was studied at atmospheric pressure. At least three products from B_2H_6 are formed in a simulated industrial flow pyrolysis reaction in the ppm concentration range at atmospheric pressure. Boron hydrides at trace concentrations exhibit stability in the presence of excess oxygen and water vapor, and may be of concern as air pollutants. This is apparent from the observed time intervals required to reduce the boron hydrides observed to nonvolatile products.

44557

APTIC NO. 67540

Research Triangle Inst., Research Triangle Park, N. C.

CONCEPTS FOR DEVELOPMENT OF FIELD USABLE TEST ATMOSPHERE GENERATING DEVICES (FINAL REPORT). *Environmental Protection Agency Contract 78-02-1242, Program Element 1HA327, ROAP 26 BFE, Rept. EPA-650/4-74-016, 167p., Dec. 1973. 86 refs.*

Possible physical, physical plus chemical, and biological concepts applicable to the development of field usable test atmosphere generating devices are investigated for the generation of sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, and 1-butene. Concepts investigated include: desorption, effusion, thin film evaporators, novel permeation, radiolysis and photolysis, plasma discharge, thin films of dissolved reactants, electrochemical films of laminated reactants, and biological generation. Based on a comprehensive literature search, panel discussions, and comparative evaluations, the effusion method is recommended for generating test atmospheres for SO_2 , CO, and 1-butene; while for O_3 , ultraviolet generation modified for more reliable and easier

operation is recommended. Gas phase titration of nitric oxide with O_3 modified for field use is recommended for generating test atmospheres of NO_2 . (Author abstract modified)

1972

44558

APTIC NO. 67491

Alessio, R. M., M. N. Palmer, T. J. Puzniak, and D. F. Rhodes
X-RAY ABSORPTION LABORATORY SULFUR/LEAD ANALYZER. *Preprint, Instrument Society of America, 16p., Jan. 1972. (Presented at the Instrument Society of America, Analytical Instrumentation Symposium, 1972.)*

An X-ray absorption analyzer for measuring sulfur and lead concentrations in liquid hydrocarbons such as fuel oil is described. The analyzer employs a long half-life gamma ray source and a specific target to provide the required low energy X-rays for which the mass absorption coefficient of both hydrogen and carbon are identical. The long-lived source allows the instrument to operate within its specified accuracy for six years without calibration. A removable sample cell, usable for high vapor pressure gasolines as well as low vapor pressure fuel oils, is designed to make all analyses independent of the sample density; the special source-target combination makes all sulfur and lead determinations independent of the carbon to hydrogen ratio of the samples. The doubly encapsulated source has a sufficiently low specific activity so as not to require the use of personnel radiation monitors by analyzer operators. The analyzer is capable of performing an analysis every four minutes over the ranges 0-10 wt% S and 0-5 g Pb/gal.

44559

APTIC NO. 67485

Corice, R. J., Jr., K. Fox, and G. D. T. Tejwani

NU SUB 1 PLUS NU SUB 3 COMBINATION BAND OF SO_2 . *Tennessee Univ., Knoxville, Earth Resources and Astrophysics Lab., National Aeronautics and Space Administration Multidisciplinary Research Grant NGL 43-001-021, Rept. UTPA-ERAL-03, 17p., Dec. 1972. 16 refs.*

NTIS: N74-22336

The infrared-active vibration-rotation combination band nu sub 1 plus nu sub 3 of sulfur dioxide was measured with moderately high spectral resolution. Quantum number identifications of spectral lines were made by comparison with theoretically computed spectra which include the effects of centrifugal distortion. Relative line intensities were also calculated. The band center for nu sub 1 plus nu sub 3 was 2499.60 ± 0.10 cm. The study is potentially applicable to studies of the terrestrial atmosphere where SO_2 plays a serious role as a pollutant. High-resolution infrared spectroscopy is a possible technique for the remote detection and monitoring of SO_2 in situ. Monochromatic laser emissions may be useful for studying terrestrial SO_2 in absorption. (Author abstract modified)

44560

APTIC NO. 67757

Hayashi, N., J. Watanabe, and K. Kawasaki

INTERACTION OF CARBON MONOXIDE WITH NICKEL SURFACE. *(Ni hyomen to CO to no sogo sayo). Text in Japanese. Denshi Gijutsu Sogo Kenkyusho Iho (Electrotech. Lab. Bull.), 36(8-9):605-610, 1972. 13 refs.*

Adsorption of carbon monoxide on multi-crystalline surface of nickel using high purity Ni filament purified by the argon ion collision method or Ni film deposited in ultra-vacuum was studied. The adsorption was carried out at room temperature. Two types of adsorption were observed with alpha-state having an activation energy of desorption of 4.4 kcal/mole and beta-state 33.2 kcal/mole. The beta-state formed in the initial stage and after the total coverage became more than 25%, alpha-state began to form. The alpha-state increased remarkably thereafter. The total molecules of CO adsorption on Ni film at saturation was higher than a previous result, presumably due to the uncleanness in the previous case. The

temperature for the maximum desorption of alpha-state was 80 deg and that for beta-state was 500 deg.

44561

APTIC NO. 63593

Meyer, B., M. Gouterman, D. Jensen, T. V. Oommen, K. Spitzer, and T. Stroyer-Hansen

THE SPECTRUM OF SULFUR AND ITS ALLOTROPES.

Advan. Chem. Ser., no. 110:53-72, 1972. 35 refs. (Presented at the American Chemical Society, Mardi Gras Symposium, New Orleans, La., Feb. 18-19, 1971.)

Orthorhombic sulfur absorbs at 285 and 265 nm because of S8; polymeric sulfur absorbs at 360 nm; liquid sulfur has an absorption edge which shifts from 400 nm at 120 C to 700 nm at 700 C. The shift is a result of changes in molecular composition and simultaneous absorption by cyclo-S8, polymeric sulfur, S4, and S3. The spectrum of sulfur vapor changes with temperature and pressure. Blue absorption is caused by S2, green absorption by S8, absorption at 400 nm by S3, and absorption at 520 nm by S4. The comparison of spectra of allotropes in various phases, including solutions and matrices, with extended Hueckel calculations shows that the spectrum of chains converges towards the near infrared with increasing molecular size, while sulfur rings all absorb in the near ultraviolet. (Author abstract)

1971

44562

APTIC NO. 67437

Smith, Clyde E., Dolphus E. Milligan, and Marilyn E. Jacox

MATRIX-ISOLATION STUDY OF THE VACUUM-ULTRAVIOLET PHOTOLYSIS OF CHLOROFLUOROMETHANE. THE INFRARED AND ULTRAVIOLET SPECTRA OF THE FREE RADICAL CLCF. J. Chem. Phys., 54(7):2780-2793, April 1, 1971. 34 refs.

The vacuum-ultraviolet photolysis of the halogenated hydrocarbon chlorofluoromethane and its dimerized counterpart isolated in an argon matrix at 14 K led to the appearance of prominent absorptions at 742 and 1146/cm which were assigned to the two stretching fundamentals of the free radical CLCF. A weak absorption band system between 3900 and 3400 A, with a 376 plus or minus 10/cm average band spacing, was tentatively attributed to CLCF, as was an emission band system which appeared between 4000 and 4900 A when the sample was excited by 3650 A radiation. The 379 plus or minus 10/cm average band spacing associated with this emission band system was tentatively attributed to the bending mode of ground-state CLCF, permitting a normal coordinate analysis for this molecule. The bending and C-Cl stretching modes were appreciably mixed. Several other groups of absorptions were also observed, but the species responsible for them were not identified. (Author abstract modified)

44563

APTIC NO. 67547

Storebo, Per B.

STEADY STATE AEROSOLS. Geofys. Publ. Geophys. Norv., 28(4): 1-101, 1971. 7 refs.

In the search for causal relationships between aerosol formation parameters and aerosol characteristics, calculations on models are presented. Formation parameters treated are supply mass, mode and spread, dilution with pure air, and particle removal. Coagulation within the aerosol is treated as a continuous phenomenon concerning all particle size combinations present. The effect is a sort of inverse relationship between distribution density of particles at medium/large and at small sizes. A number of resulting size distributions are shown. Aerosols are classified in two groups. Aerosols with slow coagulation have low mass and contain either few particles or have a narrow size distribution, preferably at small sizes. Aerosols with faster coagulation display a distinct medium size particle mode, and they have few small particles. The distribution of individual elements of natural radioactivity on

particle size is also presented. Simple aerosol age estimates based on radioactivity measurements are questionable. (Author abstract)

1970

44564

APTIC NO. 67441

Dudyrev, A. N. and M. I. Shutova

STUDY OF THE ADSORPTION OF NOXIOUS GASES BY QUARTZ DUST. In: Control of Noxious Gases in Blasting Work and New Methods of Testing Industrial Explosives. (Barba s yadovityimi gogami pri vzryvnykh rabotakh i novyi metody ispytaniy promyshlennyykh vv). 1970. 9 refs. Translated from Russian.

During blasting operations, a considerable amount of noxious gases and finely dispersed dust is produced. The dust can adsorb various noxious gases. The quantity of adsorbed gas depends on the composition of the gas and dust and on the process conditions, especially on gas pressure and temperature. The process of noxious gas adsorption by quartz dust was studied experimentally. From a gas mixture containing 2.47-9.5% nitrogen dioxide at a temperature of 18 C, 0.1974-0.3412 mg of nitrogen oxides were adsorbed on the surface of 1 g of quartz dust particles and 0.1819-0.2419 mg on iron ore dust. Under the same conditions, traces of carbon monoxide are adsorbed by the dust particles from a gas mixture containing up to 10% CO. The toxicity of mining dust is enhanced by the adsorbed gases they contain. The adsorption of noxious gases containing nitric oxide and CO by the quartz dust of Ural mines was also studied. The mean adsorption values of NO and CO were 2.8022 and 2.2318 mg/g of dust, respectively. Other conditions being equal, the amount of NO adsorbed by quartz dust exceeds the values for CO adsorption. With a decrease in pressure, the adsorption capacity of 1 g of dust decreases. With an increase in temperature, the adsorption capacity of quartz dust for NO and CO decreases. With an increase in the diameter of dust particles, the adsorption capacity of dust decreases for NO and CO.

1969

44565

APTIC NO. 67460

Gogolinski, H.

AN EXAMPLE OF CALCULATING DUST CONTENT IN DUCT-CARRIED GASES ON THE BASIS OF EXISTING RECOMMENDATIONS. Air Conserv. (English translation from Polish of: Ochrona Powietrza), 3(2/10):49-54, 1969.

The concentration of dust in a gas before it enters a bag filter installed in the dust removal system for cleaning the gaseous emissions from a rolldown furnace for crude zinc oxide production was calculated from measurements made in a horizontal section of the duct preceding the filter. The round cross section was divided into five composite surfaces. The dust content in the gas was measured by a dust meter, with a speed probe, a measuring filter, and a double orifice, all located before the industrial filter.

1932

44566

APTIC NO. 67443

Thom, Charles and Kenneth B. Raper

THE ARSENIC FUNGI OF GOSIO. Science, 76(1980):548-550, Dec. 9, 1932. 7 refs.

Survey testing of stock cultures of molds and studies of the effect of arsenical dusts and sprays upon soil microflora were performed to test an hypothesis by Gosio (1892) that certain fungi, called arsenic fungi, are capable of setting free gases like arsine from arsenic compounds. Arsenic fungi appeared more numerous than previously supposed, and some

saprophytic species common in the soil were active in the production of arsenical gases. Arsenic tolerant forms included many species which did not decompose arsenic compounds with the evolution of gases. Arsenical substances carried to the soil came in contact with decomposing agents which tended to convert the arsenic compounds into volatile or quickly soluble forms. The disintegration of arsenical compounds appeared to be caused by a considerable variety of fungi.

EFFECTS-HUMAN HEALTH

1974

44567

APTIC NO. 67943

Andersen, Ib, Per Camner, Preben L. Jensen, Klas Philipson, and Donald F. Proctor

A COMPARISON OF NASAL AND TRACHEOBRONCHIAL CLEARANCE. *Arch. Environ. Health*, 29(5):290-293, Nov. 1974. 13 refs.

Tracheobronchial clearance and nasal clearance were compared in 13 pairs of monozygotic twins and 11 nontwins to investigate the possibility of deriving information on a subject's transport velocity in the tracheobronchial tree from studying the more readily accessible nose. Tracheobronchial clearance was studied by having the subjects inhale, by mouth, a test aerosol of 6 micromol particles tagged with technetium-99m and making external measurements of the radioactivity. Nasal clearance was studied with two methods: an 0.6 mm anion resin particle tagged with Tc-99m was externally followed at five different points along the nasal passage and a saccharine particle was placed on the mucociliary mucosa anteriorly in the nose, with the time being registered until the subject noted a sweet taste. A weak positive association existed between tracheobronchial clearance and nasal clearance as studied with the saccharine particle method, but no association appeared between tracheobronchial clearance and nasal clearance as tested by the tagged resin particle method. (Author abstract modified)

44568

APTIC NO. 67669

Flowers, Earl S.

RELATIONSHIP BETWEEN EXPOSURE TO ASBESTOS, COLLAGEN FORMATION, FERRUGINOUS BODIES, AND CARCINOMA. *Am. Ind. Hyg. Assoc. J.*, 35(11):724-729, Nov. 1974. 20 refs. (Presented at the American Industrial Hygiene Conference, Minneapolis, Minn., June 1-6, 1975.)

Exposure to asbestos is associated with chronic fibrosing processes, formation of ferruginous bodies, and an increased risk of carcinoma. It is possible to relate the various biological responses to asbestos exposure in terms of fundamental effects on the redox state of cells or tissues. Collagen synthesis is mediated by the level of alpha-ketoglutaric acid, and the rate of collagen formation is directly related to the rates of fibrosis, including elastin formation. The increase in oxidative reactions associated with collagen formation is thought to increase the amount of ferric iron bound to cellular protein, resulting in formation of a silicate-iron(III) bond on an asbestos fiber. The iron-containing protein bound to the asbestos fiber by the strong silicate ionic bond is a ferruginous body. The corresponding decrease in the ferrous-ferric redox couple inhibits electron transport, thus stabilizing exoperoxides and free radicals thought to be involved in the initiation of carcinomas. (Author abstract)

44569

APTIC NO. 67626

Fujii, Masami

ORGANIC CYANOGEN COMPOUNDS. (Yuki shian kagobutsu). Text in Japanese. *Kankyo Hoken Reporto (Environ. Health Rept.)*, no. 30, 65-81, July 1974.

A general discussion is given on the physical properties and toxicities of organocyanogen compounds. Fatal concentrations of acrylonitrile for rats are 2500 ppm (in air) for 1 hr, 1300 ppm for 2 hr, 650 ppm for 4 hr, and 325 ppm for 8 hr, and 110 ppm for 4 hr for dogs. Acrylonitrile causes weakness, headache, dizziness, vomiting, stomach pain, and liver damage. The fatal concentration of acetone cyanohydrin is 100 ppm for 2 min for rats. It has a high density and low volatility. Acetonitrile has lower toxicity compared to acrylonitrile. It gives odor at about 40 ppm and is acutely toxic at 500 ppm. The fatal concentration of acetonitrile in air for rats is 16,000 ppm for 4 hr and 53,000 ppm for 15 min. Inhalation of high concentration vapor to acetonitrile causes lung inflammation, vomiting, and damages to the central nervous system. Toxicities of isocyanates are also mentioned.

44570

APTIC NO. 67667

Goldsmith, John R. and Kenneth Berglund

EPIDEMIOLOGICAL APPROACH TO MULTIPLE FACTOR INTERACTIONS IN PULMONARY DISEASE: THE POTENTIAL USEFULNESS OF PATH ANALYSIS. *Ann. N. Y. Acad. Sci.*, vol. 221:361-375, 1974. 17 refs.

Epidemiology can indicate the nature of potentially reversible associations between causal factors and disease. It is most effective if it interacts with research, involves a sufficiently complete set of appropriately represented variables, and uses a strategy appropriate for the problem combining appropriate sampling, classification, and statistical procedures. Epidemiological studies, under these circumstances, can indicate which health policies are likely to have favorable benefit-cost relationships. The relationships between smoking and lung cancer and between tuberculosis and occupational dust diseases are used to provide some background for an effort to deal with the multiple variables associated with chronic nonspecific respiratory disease epidemiology in children and adults. If variables are ordered, the procedures described as path analysis can be used to determine the likely causal relationships of a series of independent variables with one or more dependent health variables. An array of variables likely to be associated with bronchitis and asthma in childhood and for morbidity or disability from bronchitis or emphysema in adult life are given. A proposed ordering or path diagram of the variables from which a path analysis could be developed is then presented. Necessary data could be obtained from census-tracked morbidity or mortality in a large urban area, from employee groups in a large company, or from observations at a series of schools. Applications to some data sets are discussed - chronic respiratory disease in children and lung cancer epidemiology.

44571

APTIC NO. 67574

Ito, Tatsuo

INVESTIGATION OF OFFICIALLY RECOGNIZED POLLUTION VICTIMS: NO. 1: MORBIDITY OF AGE 60 AND ABOVE. (Kogaibyō nintei kanja chosa. sono 1: 60 sai ijo no rojin no byōjo jittai ni tsuite no hokoku). Text in Japanese. Preprint, All Japan Democratic Medical Union, p. 36, 1974. (Presented at the All Japan Democratic Medical Union Scientific Meeting, 2nd, Sendai, Japan, Oct. 26-27, 1974.)

The mortality officially recognized air pollution victims has increased drastically this year in Kawasaki. Of 1902 officially recognized pollution patients, 92 died so far; and as of July 1974, 26 died this year. All the deaths were in persons older than 60 years of age. This has increased the insecurity, fear, and anxiety of patients, and hospital staff members also began

to feel disturbed. However, thorough examinations showed that there was no basic fault on the part of hospital administrations and medical staff. In group discussions this was explained to patients. Health conditions and living conditions were examined to improve the situation. Circulatory diseases are very often immediate causes of death for the old. The patients' blood pressure, pulse, cyanosis, electrocardiogram, vitellar, blood counts, sputum, urine were examined, and questions were asked regarding their work records, living conditions, opinions, and desires in relation to hospitals.

44572

APTIC NO. 67523

Knelson, John H., Jean G. French, and Carl M. Shy

HEALTH ASPECTS BASIS FOR THE U. S. AIR QUALITY STANDARD FOR NITROGEN DIOXIDE. Preprint, VDI (Verein Deutscher Ingenieure) Duesseldorf (West Germany), 32p., Sept. 13, 1974. 45 refs. (Presented at the Colloquium on Nitrogen Oxides, Duesseldorf, West Germany, Sept. 13, 1974.)

The health effects basis for the United States air quality standard for nitrogen dioxide is reviewed. Nitrogen dioxide is acutely fatal to humans at levels of 282,000 micrograms/cu m and above, and at concentrations between 47,000 and 188,000 causes acute but reversible bronchitis, bronchiolitis, and pneumonia. The Chattanooga School Children Studies assessed the influence of NO₂ on acute respiratory disease experience in populations and constitute much of the basis for the air quality standard. The data affirmed a relationship between NO₂ exposure and impairment of resistance to human respiratory pathogens. Diminished lung function in 7 and 8 year old children was attributed to repeated 2-3 hr daily peak NO₂ concentrations of 282 to 940 micrograms/cu m. The present primary national standard for NO₂ of 100 micrograms/cu m annual arithmetic mean should be reasonably protective of public health and appears to contain a margin of safety not excessively large. Very little is known about the inhalation toxicology of inorganic nitrates. There may be an association between airborne nitrates and asthmatic attacks.

44573

APTIC NO. 67605

Mandi, A., E. Galambos, G. Galgoczy, M. Szabo, and K. Kollar

RELATIONSHIP BETWEEN LUNG FUNCTION VALUES AND AIR POLLUTION DATA, IN BUDAPEST SCHOOLCHILDREN. *Pneumonol. (Berlin)*, 150(2-4):217-225, 1974. 44 refs.

The clinical condition and lung function of 14-year-old schoolchildren from three different districts of Budapest were recorded monthly between November 1972 and May 1973. Total airway resistance and specific conductance values and lung volumes were measured and air pollution was recorded simultaneously. The latter differed significantly in the three districts. The monthly and daily average sulfur dioxide, nitrogen oxide, chlorine, and dust concentrations were determined along with the meteorological parameters such as temperature, humidity and barometric pressure. The expected correlation between the monthly mean SO₂ concentrations and the seasonal heating period was confirmed. The highest SO₂ concentrations were measured in the center of the city. The mean monthly value reached 0.91 mg/cu m SO₂ in December. There were no seasonal or local differences between NO_x and Cl₂ concentrations. The maximum mean monthly NO_x concentration was 0.19 mg/cu m and the Cl₂ concentration 0.36 mg/cu m. The maximum dust fall measured was 37 and 38 g/sq m/mo. Although there were significant differences between the monthly lung function values and monthly air pollution, there was no evidence for any connection between the function values and environmental factors.

44574

APTIC NO. 67556

Miura, Shiro

PHOTOCHEMICAL SMOGS IN KANAGAWA PREFECTURE. (*Kanagawa-ken no kokagaku sumoggu ni tsuite*).

Text in Japanese. Tokyo Kanku Chihō Kisho Kenkyukai-shi (Geophys. Notes, Tokyo Dist. Meteorol. Obs.), no. 7:40-41, Sept. 1974.

The state of air pollution in Kanagawa prefecture is continuously monitored at 56 locations. The data of the 1972-73 high oxidant concentration (more than 0.15 ppm) frequency was used for a study of local characteristics of photochemical smogs. Starting with the highest frequency, the order of cities with a high oxidant concentration was Kawasaki (especially north), the Midori ward of Yokoyama, Sagami-hara, Isehara, and Hiratsuka. Many of the main arteries connecting the area with Tokyo go through Kawasaki, Yokohama, and Sagami-hara, and main arteries from Tokyo-Yokohama to the Eastern Seaboard area go through Isehara and Hiratsuka. The health damage episodes were most frequent in Kawasaki and Yokohama. In districts other than the Midori ward of Yokohama, where concentration was relatively low, health damage incidents did occur though not as frequently as in the Midori ward. Most of the health damage incidents were related with school, 94% in 1971, 72% in 1972, and 85% in 1973, and occurred mostly to children who were exercising in the playground. If the schools were out on Sundays or during summer vacations, the number of health episodes was extremely small.

44575

APTIC NO. 67561

Moore, W. Jr., D. Hysell, W. Crocker, and J. Stara

BIOLOGICAL FATE OF 103 PD IN RATS FOLLOWING DIFFERENT ROUTES OF EXPOSURE. *Environ. Res.*, 8(2):234-240, 1974. 6 refs.

The retention, tissue distribution, and excretion of 103-palladium in adult rats was determined following oral, intravenous (iv), and intratracheal administration. The highest retention was obtained following iv dosing, and lowest retention (less than 0.5%) occurred after oral dosing. Tissues containing the highest concentrations of 103-Pd were the kidney, spleen, liver, lung, and bone. Following a single oral dose, almost all of the 103-Pd was excreted in the feces due to nonabsorption, whereas after iv dosing, similar quantities were excreted in both the urine and feces. In pregnant rats following iv dosing, 103-Pd was not found in any of the fetuses. The 103-Pd was transferred to suckling rats via the dam's milk. (Author abstract modified)

44576

APTIC NO. 67635

Natusch, David F. S. and John R. Wallace

URBAN AEROSOL TOXICITY: THE INFLUENCE OF PARTICLE SIZE. *Science*, 186(4165):695-699, Nov. 22, 1974. 34 refs.

The thesis that particle size is an extremely important parameter to consider when assessing the potential toxicity of species present in urban areas is discussed. Surface adsorption or condensation greatly promotes toxicity. In the majority of cases, particles that are less than 1 micron in size are of primary importance. Special significance is attached to the organic constituents of aerosols. Many of these are known as potential carcinogens, and most predominate in extremely small particles which become deposited almost exclusively in the lung. The respiratory deposition profiles of iron, lead, and benzo(a)pyrene in an urban aerosol are described. (Author conclusions modified)

44577

APTIC NO. 67498

Pfister, A. and C. Nogues

LUNG LESIONS INDUCED BY OXYGEN FOR OZONE IN THE RAT. (*Determinisme des lesions pulmonaires provoques par l'oxygene ou l'ozone chez le rat*). Text in French. *Pathol.-Biol.*, 22(1):89-98, Jan. 1974. 55 refs.

Lung lesions were induced in rats as a result of oxygen or ozone exposure. Modifications observed at the pulmonary level consisted of the opposite phenomena of alteration and reaction, and lesions were characterized by necrosis and exsu-

dative inflammation caused by oxidative metabolic modifications of the pulmonary cells. The regenerative process consisted of a reepithelialization from type II pneumocytes and of a renewal of interstitial tissue. Prognosis depended to a certain degree on the extent of the regenerative process; though, if the process was exaggerated, diffuse interstitial fibrosis or even progressive fibrosing alveolitis occurred. The alveolar surfactant intervened in two cases: a sudden lack favored atelectasis and alveolar edema in the aggressive stage, while a neoproduction favored the ad integrum repairing in the adaptation stage. The reaction of the rat lungs to oxygen or ozone was similar to that observed in many other poisonings and experimental models of pathological state and was also analogous to human lung reactions.

44578

APTIC NO. 67607

Sato, Akio, Tamie Nakajima, Yukiko Fujiwara, and Kiichi Hirose

PHARMACOKINETICS OF BENZENE AND TOLUENE.

Int. Arch. Arbeitsmed., 33(3):169-182, 1974. 14 refs.

Experiments were conducted with humans and rabbits on the pharmacokinetics of benzene and toluene. Elimination curves obtained from a single exposure in which three male human subjects inhaled 25 ppm of benzene and 100 ppm of toluene for 2 hr were graphically resolved into a sum of three exponential components for the concentrations in the blood. The solubility of benzene and toluene in various body tissues of rabbits was investigated. The tissue-blood partition coefficients for most body tissues were in the range of 1-3. Solvent vapors were extremely soluble in fat, approximately 30-50 times as much as in the blood. Using these results, a mathematical model for the absorption, distribution, metabolism, and elimination of the solvents was constructed. The model offers a possible explanation for the three-exponential decay observed in the human experimental exposure.

44579

APTIC NO. 67709

Stewart, Richard D., Edward D. Baretta, Leigh R. Platte, Elizabeth B. Stewart, John H. Kalbfleisch, Barbara Van Yserloo, and Alfred A. Rimm

CARBOXHEMOGLOBIN LEVELS IN AMERICAN BLOOD DONORS. *J. Am. Med. Assoc.*, 229(9):1187-1195, Aug. 26, 1974. 15 refs.

A national survey was conducted in 1969-1972 to determine the range of carboxyhemoglobin levels in various segments of the American population. Venous blood samples for COHb analysis were obtained from 29,000 blood donors living in urban, suburban, and rural communities in the U. S. For comparative purposes, COHb measurements were made on samples obtained from 11 volunteers breathing air free of carbon monoxide or air with known concentrations of CO. The mean COHb saturation of four adults breathing CO-free air was 0.45%. Forty-five percent of all the nonsmoking blood donors tested had COHb saturations of more than 1.5%. This indicated that exposure to CO in excess of that permitted by the Federal air quality standards was widespread and occurring regularly. Tobacco smoking was the single most important factor responsible for the highest COHb saturations observed. The other chief factors influencing the COHb saturation were the geographical location of the individual, occupation, and the existing meteorological conditions. (Author abstract modified)

44580

APTIC NO. 67950

Stringer, Claude A., Jr., Ralph A. Zingaro, Billy Creech, and Frank L. Kolar

LEAD CONCENTRATIONS IN HUMAN LUNG SAMPLES. A STATISTICAL ANALYSIS. *Arch. Environ. Health*, 29(5):268-270, Nov. 1974. 17 refs.

Atomic absorption spectrophotometric analyses for lead were performed on 66 human lung samples furnished from autopsies at Houston hospitals. Relationships between lung lead concentrations and sex, occupation, age, geographical residence, and

race were examined statistically using a computer program which performed a complete univariate and multivariate analysis. Lung tissue was selected for analysis because it reflects the lead that is absorbed into the body and redeposited in the tissue as well as any lead that is deposited in the respiratory tract but not yet absorbed. Significant variations in lung lead concentrations were associated with sex, occupation, and age, while no significant variations were demonstrated with respect to geographical residence or race. The positive correlation with respect to occupational exposure was not unexpected since an increased exposure to lead is inherent in certain industrial areas. The statistically significant correlation of pulmonary lead concentrations with respect to age demonstrated that lead exposure from all sources in the Houston area leads to its accumulation in lung tissue.

44581

APTIC NO. 67944

Waldron, Harry A.

THE BLOOD LEAD THRESHOLD. *Arch. Environ. Health*, 29(5):271-273, Nov. 1974. 50 refs.

The current blood lead threshold limit of 80 micrograms/100 g of blood is discussed in light of increasing evidence of subclinical effects from lead in concentrations below 80 micrograms/100 g blood. The current threshold limit for blood lead is based on investigations of men employed in lead industries and properly only applies to such persons. Aside from the observation of subclinical effects in persons exposed to doses of lead that are insufficient to produce classical clinical lead poisoning, blood leads of less than 80 micrograms/100 g blood are also observed in some patients still exposed to lead sources. The current threshold value for blood lead is considered too high, and a system is proposed for referring to blood lead concentrations in terms of standard deviations from a mean, with plus three standard deviations being the highest allowed for adults and plus two standard deviations the highest allowed for children. On this basis, adult blood lead concentrations should not be permitted to rise above 50 micrograms, while levels for children should not be permitted to rise above 30 micrograms. The main value of blood lead concentrations is to monitor abnormal exposure in a population rather than to serve as a major diagnostic tool.

44582

APTIC NO. 63692

Yeramyan, S. G., A. K. Dashtoyan, and N. N. Sunguryan

THE STATUS OF THE FUNCTION OF THE EXTERNAL RESPIRATION IN PATIENTS WITH TUFF-INDUCED PNEUMOCONIOSIS. (Sostoyaniye funktsii vneshnego dykhaniya u bol'nykh tufovym pnevmokoniozom). *Text in Russian. Gigiena Truda i Prof. Zabolevaniya*, no. 4:49-51, 1974. 8 refs.

Results of spiographic, pneumotachometric, and capnographic tests performed in 50 35-50 year-old tuff miners with the initial and first stage of tuff-induced pneumoconiosis are presented. The test persons had been exposed to dust for 9 to 28 yr. Hyperventilation with reduced depth of respiration, tachypnea, reduction of the vital and reserve capacities, tendency of increased oxygen consumption, change in the bronchial passage, tendency of hypocapnia, tendency of reduced fractional carbon dioxide concentration in the alveolar phase, and increased CO₂ partial pressure in the alveolar phase were diagnosed. Prevalence of obstructive ventilatory insufficiency, and predominance of functional changes of the lungs over morphological changes were determined.

44583

APTIC NO. 67666

Kyoto Municipal Government (Japan), Dept. of Environmental Pollution Control

THE EFFECTS OF AIR POLLUTION ON ADULT HEALTH. (Seijin no kenko ni oyobosu taiki o sen no eikyo). *Text in Japanese. In: Kyoto-shi Kogai Ekigaku Kenkyu Hokoku. (The Epidemiological Research Report on Environmental Pollution in Kyoto City)*. p. 13-23, March 1974.

EFFECTS-HUMAN HEALTH

44587

The entire city of Kyoto was divided into 800 blocks by 0.5 km mesh and seven or eight families per one mesh (with the restriction of the family head being between ages 45 and 59) were chosen at random. Parts of the first investigation five years ago, 965 households, were included for a follow-up study. A similar questionnaire 5 years ago was sent to each household. The recovery rate was 89%. The responses from 2575 women (40-59 year old housewives, including 596 followup persons) were analyzed. Chronic bronchial symptoms (continuous daily coughs and sputum in winter for over a month) had a significant correlation with the degree of air pollution classified by area; the maximum and minimum of morbidity for chronic bronchitis symptoms were 7% and 4%, respectively; there were five different degrees of air pollution between these two figures. The morbidity of polluted district residents for chronic bronchial symptoms was 60% of the most heavily polluted district of Osaka, and 140% of the least polluted district of Osaka. Although not distinct, the adult chronic bronchial symptoms seemed to have increased slightly in the last several years. As a general conclusion, it is stated that although Kyoto is not heavily polluted by sulfur dioxide, the citizens respiratory symptoms are definitely related with the geographical patterns of air pollution.

1973

44584

APTIC NO. 67691

Adachi, S. and T. Okubo

INTERRELATIONSHIP BETWEEN THE DAILY CHANGE OF AIR POLLUTION AND THAT OF FATALITY. (*Taiki osen oyobi shibo no hihendo no sogo kankei ni tsuite*). Text in Japanese. *Nippon Eiseigaku Zasshi* (Japan. J. Hyg.), 28(1):146, April 1973.

The relation between daily mortality rate and various kinds of air pollutants was analyzed to determine ages and the cause of death. The most important factors related to daily mortality change were temperature and suspended dust. In many cases, other pollutants (carbon monoxide and nitrogen oxides) correlated to this change, but it was very difficult to estimate them. A positive correlation occurred between the fatality rate of persons who were more than 60 years old and pollutants.

44585

APTIC NO. 67576

Chen, C., T. Nakajima, and S. Kusumoto

THE CHANGE OF HISTOLOGICAL FINDINGS IN RESPIRATORY ORGANS OF OUTDOOR EXPOSED MOUSE. (*Yagai bakuro mausu no kokyuki no soshikigakuteki shoken no suiri ni tsuite*). Text in Japanese. *Nippon Eiseigaku Zasshi* (Japan. J. Hyg.), 28(1):137, April 1973.

A comparative study was made of histological findings of the changes in respiratory organs of mice bred in outdoor exposure chambers and mice bred in the air purified by an activated carbon layer for 20 mo since December 1970. The group in the outdoor exposure chamber showed a slight desquamative bronchitis and the appearance of dust cells after 3 to 6 mo, while the group in the purified air showed normal condition even after 20 mo. The trachea of the former group showed enlargement of the mucous gland (filled with secretion) accompanied by submucosa monocytes and lymphocyte infiltration after 20 mo. In the pharynx, lymphocyte infiltration was also observed. In lungs, enlargement of bronchus, ser-piginous, ablation of mucous epithelium, appearance of dust cells, and hypertrophy of lymph node were recognized after 1 yr. Some of them showed local papillate proliferation of mucous epithelium after 20 mo. Exposure for 20 mo brought about not only high accumulation of dust in the lung, but also chronic bronchitis.

44586

APTIC NO. 67431

Gordus, A. A., C. C. Maher, III, and G. C. Bird

HUMAN HAIR AS AN INDICATOR OF TRACE METAL ENVIRONMENT EXPOSURE. *National Science Foundation-Research Applied to National Needs*, Washington, D. C., *Environmental Aspects of Trace Contaminants Program*, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 463-487. 15 refs. (Aug. 8-10.)

NTIS: CONF-730802

Both present-day and historical head-hair samples up to 200 years old were analyzed for 38 trace elements using neutron activation and flameless atomic absorption spectrophotometry. This study, to determine the extent of environmental trace metal pollution, was designed to permit evaluating the relationship between the trace metal content of hair and a wide variety of factors such as age, sex, diet, hair color, shampoos, and extent of hair washing, and between the trace metal content of blood and the level of human intake of trace metals from pre-industrial periods to the present. Over 800 well-documented historical hair samples were obtained from museums and private owners; they consisted primarily of hair encased in lockets or brooches, as well as imitation-floral wreaths made of hair. The modern samples included hair from Naval Academy midshipmen and Air Force Academy cadets both upon their arrival at the academies in mid-1971 and again 6, 11, and 22 mo later after equilibration to fixed diets and environments. Examples of some of the initial historical and modern hair analysis data are presented. In some cases it appeared that the human intake of certain trace metals may have decreased during the last 100 years. Microscopic and visual examination studies included determination of color, cuticle type and pattern, medulla and cortex appearance, thickness, refractive index, birefringence, and water and hydroxide penetration rate. The various trace metal data were subjected to statistical multivariate analysis to determine the degree of correlation between element concentrations, the various physical properties of hair, and the remaining variables of age, sex, and diet. (Author abstract modified)

44587

APTIC NO. 63954

Leeder, S. R., Ann J. Woolcock, and C. R. B. Blackburn

PREVALENCE AND NATURAL HISTORY OF LUNG DISEASE IN NEW SOUTH WALES SCHOOLCHILDREN. *Int. J. Epidemiol.*, 3(1):15-23, 1974. 17 refs. (Presented at the Australian Regional Meeting of the International Epidemiological Association, Sydney University, Australia, Aug. 1973.)

Results of a five year longitudinal survey are presented for the interactive effects of lower respiratory tract illness and social and environmental factors on the lung function of 12,000 Sydney schoolchildren. Lung function was assessed with the maximum expiratory flow-volume curve which provided values for peak expiratory flow, timed expiratory volumes, and vital capacity. Flow rates during the latter half of forced expiration were measured from the MEFV curve as indices of function of the smaller airways. Lung function values of normal children compared closely with published data from other children of European origin, whereas children with a history of lower respiratory illness tended to have slightly, but significantly, lower values for some lung function measurements than children without such history. The prevalence of a history of treated asthma, bronchitis alone, and bronchitis with asthma was similar to that found in other populations of children studied in Australia. Smoking prevalence patterns among the Sydney schoolchildren examined suggested that the subjects were responding in early years to anti-smoking education but disregarding these warnings by the age of 14. Air pollution appeared to play only a small role in the respiratory functions of the children examined since levels of important pollutants in the city of Sydney are low by international standards. Automotive pollution levels are relatively high, but photochemical reactions are uncommon.

44588

APTIC NO. 67735

Nikulin, K. G.

CHRONIC BRONCHITIS AS A SOCIAL AND MEDICAL PROBLEM. (*Khronicheskii bronkhit kak sotsial naya i meditsinskaya problema*). Text in Russian. *Terapevt. Arkh.*, no. 45:44-47, March 1973.

Clinical, prophylactic, and therapeutic aspects of chronic bronchitis are discussed. Chronic bronchitis may be due to infection, poisoning, dust and allergy. Endobronchitis, respiratory insufficiency, panbronchitis, paribronchitis, peribronchitic fibrosis, obstructive emphysema, bronchiectases, possible transition to chronic pneumonia, and cor pulmonale are the basic manifestations of chronic bronchitis.

44589

APTIC NO. 67488

Schimmel, H., T. J. Murawski, and N. Gutfield

RELATION OF POLLUTION TO MORTALITY, NEW YORK CITY, 1963-72. Preprint, 16p., 1973 (?). 1 ref.

Results are presented from a study of the relation of air pollution in New York City to mortality over the 10 year period 1963-1972. The study is based on almost 900,000 deaths reported over the 10-year period and is an extension of an earlier study of similar nature covering the period 1963-1968. Mean daily mortality data are reported by category of disease, pollution category, mean temperature, and percentage of total excess deaths associated with pollution. Disease categories include respiratory, heart, and other circulatory disorders, while pollutants examined include sulfur dioxide and smoke shade. The data show that the lethal effects of pollution continued to be as great during the latter four years of the study period as in the earlier 6-year period, despite an average SO₂ level in the latter period of 40% that of the earlier period. The sulfur dioxide contribution to the combined effects of the two pollutants also appeared to have doubled, despite its reduction in concentration. Seasonal trends in relation to excess deaths are mentioned. Reconsideration of the significance of SO₂ levels and the interpretation of epidemiological studies based on this pollution measure are recommended. (Author conclusions modified)

44590

APTIC NO. 67578

Tsuruta, M., K. Namie, and K. Takemoto

INFLUENCE OF AIR POLLUTION OF LUNG RESPIRATORY ORGAN-1. HISTOLOGICAL STUDY ON DOG LUNG BRONCHIA (3). (*Taiki oson no hai kokyukikei ni oyobosu eikyo-1. inu hai kikanshikei no soshikigakuteki kenkyu (3)*). Text in Japanese. *Nippon Eiseigaku Zasshi* (Japan. J. Hyg.), 28(1):140, April 1973.

A comparative study of the mutual relationship among epithelium diseases (squamous epithelial metaplasia, mucous secretion cell proliferation) and intrapulmonary epithelial proliferative diseases was made in order to analyze the cause of epithelium diseases in the upper airway tract. These two disease groups are regarded as a series of diseases (or diseases which show biological reaction from the same causes) from the morphological point of view. Pathologically it may be possible to consider the process as squamous epithelial metaplasia (which entails mucous secretion cell proliferation, epithelium deficiency, and regeneration). The disease might be caused by continuous stimulation by gaseous material. Intrapulmonary epithelial disease (especially in peripheral areas) has a strong relationship with intrapulmonary dust morphologically as well as statistically. There are some distinct morphological differences between epithelium disease in the upper airway tract and intrapulmonary epithelium diseases.

44591

APTIC NO. 67432

Wetherill, G. W., M. B. Rabinowitz, and J. D. Kopple

STABLE ISOTOPE STUDIES OF HUMAN LEAD METABOLISM. *National Science Foundation-Research Applied to National Needs*, Washington, D. C., *Environmental Aspects of Trace Contaminants Program*, Proc.

Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 510-518. 7 refs. (Aug. 8-10.)

NTIS: CONF-730802

Variations in stable isotope abundance patterns of lead in the environment have proven useful in identifying sources of contamination and in tracing the movement of lead. In order to investigate human uptake of lead in ambient urban conditions, it is necessary to artificially label either the diet or air, because food and air leads have similar isotope abundances. A healthy man was fed a nutritious diet low in Pb content (156 micrograms/day) for 144 days in a metabolic unit. During the first 104 days, he also received 204 micrograms of lead(204), a rare nonradioactive isotope, as lead nitrate to achieve a normal Pb intake. Concentration and isotopic composition of Pb was determined by mass spectrometry in all feces and urine and serially in diet, blood, and other body tissues and fluids. About 10% of dietary lead was absorbed and 8 micrograms/day was excreted endogenously into feces. Kinetic analyses identified 2 lead pools. Pool one, distributed primarily in blood, contained about 1800 micrograms of Pb and had a half-life of 19 days. Pool two was as long lived and about half as large. Urine and blood were in isotopic equilibrium while the lead in bile, gastric fluid, and hair appeared to come from pool two. If the subject was assumed to be in neutral Pb balance, then the amount of Pb incorporated through inhalation, 17 micrograms/day, was half as much as was absorbed through the gastrointestinal tract. When dietary Pb(204) was discontinued, blood, urine, and fecal Pb decreased, and these data suggested a close relation between blood, urine, and dietary Pb at this exposure range. No homeostatic mechanism for a preferred blood lead level was seen. A preliminary experiment on one subject and an experiment in progress on another showed similar results. (Author abstract)

44592

APTIC NO. 67548

Yabu, M., H. Honma, K. Saito, and E. Takakuwa

THE EFFECTS OF SMELL TO BIOLOGICAL BODY. (*Nioi busshitsu no seitai ni oyobosu eikyo*). Text in Japanese. *Nippon Eiseigaku Zasshi* (Japan. J. Hyg.), 28(1):194, April 1973.

In order to provide some knowledge for the establishment of an environmental standard for odor, the body reaction against odor was studied from the viewpoints of performance, cerebral action, and the threshold value of physiological function. Twenty-six healthy adult males smelled ten kinds of standard solution for sense of smell (beta-phenyl ethyl alcohol, d-camphor, exaltolide, gamma-undecalactone, phenol, acetic acid, isovaleric acid, cyclohexene, skatol, and diallyl sulfide) and the smell threshold value was measured for each smell. The values showed a normal distribution ranging between 10-3 and 10-6. The effects of smell are influenced by the kind of smell and the concentration of smell, and further study must be made of physiological function and body reaction related to smell for the establishment of environmental standards of odor.

44593

APTIC NO. 67810

President's Science Advisory Committee. Washington, D. C., Panel on Chemicals and Health

CHEMICALS AND HEALTH. *National Science Foundation, Washington, D. C., Science and Tech. Policy Office*, 222p., Sept. 1973. 120 refs.

GPO

The sources and control of air pollutants and their effect on human health are discussed. Transportation is the major source of carbon monoxide (111.0 millions of tons/yr) and hydrocarbons (19.5 millions of tons/yr). Fuel combustion in stationary sources accounts for most of the sulfur dioxide (26.5 millions of tons/yr), while industry is responsible for most of the particulates (13.1 millions of tons/yr). Total emissions of SO₂ and CO do not show any significant change in trends, but there is a recent decrease in ambient air levels. Air

pollutants in large urban areas may be responsible for 15% of the 40,000 deaths/yr from respiratory diseases other than cancer. Possibly 5% of the 55,000 annual lung cancer deaths arise from air pollution. Effective control procedures are most efficiently aimed at source control or substitution. Realistic approaches for identifying major industrial and non-industrial sources are recommended.

1972

44594

APTIC NO. 67882

Ayres, Stephen M.

BIOLOGICAL EFFECTS OF SOLVENT EMISSIONS: THE PHOTOCHEMICAL SMOG SYNDROME. *AICHE Symp. Ser.*, 68(126):285-288, 1972. 16 refs.

The health effects of solvent emissions and their relationship to photochemical smog are described. Hydrocarbons and their chlorinated derivatives may directly injure the respiratory system, but their major toxicity resides in their role as raw materials for the production of oxidizing substances. Atomic oxygen is produced by the ultraviolet light mediated photolysis of nitrogen dioxide. Hydrocarbons are central in the continuing production of oxidizing material since they are attacked by atomic O₂ and transformed to free radicals. There are significant health effects of ozone at concentration levels found in community air. Nose and throat irritation begins at levels below 0.1 ppm and definite lung effects may be seen above 0.6 ppm. Eye symptoms are usually seen above 2.5 ppm. Administration of 1 ppm for period as long as 1 yr permanently damages airway and lung tissue, producing chronic bronchitis, bronchiolitis, emphysema, and fibrosis. Solvents are potentially hazardous to plants and animals in addition to causing serious damage to liver, kidneys, and nervous system.

44595

APTIC NO. 67535

Chapman, R., J. French, J. Finklea, and H. Goldberg

DOSE-RESPONSE RELATIONSHIPS LINKING SHORT-TERM AIR POLLUTION EXPOSURES TO AGGRAVATION OF CARDIO-RESPIRATORY ILLNESS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C.*, 17p., 1972 (7). 3 refs.

Epidemiologic studies on the effects of day to day fluctuation in air pollution levels on human health are summarized. In Utah, on days of minimum temperature above 50 deg, asthma attack rates increased consistently as both total suspended particulates (TSP) and suspended sulfate (SS) levels increased. Levels of SS, above which excess attacks could be expected were 17.4 micrograms/cu m for days of minimum temperature between 30-50 degrees and at 1.4 micrograms/cu m for warmer days. In New York, the estimated SS threshold for excess asthma attacks was lower on days of minimum temperature above 50 deg than on cooler days (7.3 micrograms/cu m and 12 micrograms/cu m, respectively). In cardio-pulmonary patients, the level of SS above which excess symptom rates could be expected was 9.2 micrograms/cu m for days of minimum temperature between 20-40 deg. (Author summary modified)

44596

APTIC NO. 67746

Hernberg, Sven and Jorma Nikkanen

EFFECT OF LEAD ON DELTA-AMINOLEVULINIC ACID DEHYDRATASE. A SELECTIVE REVIEW. *Pracovní Lekar*, vol. 24:77-83, 1972. 43 refs.

A review is presented on the use of delta-aminolevulinic acid dehydratase assay as an exposure test for lead. Absorption of Pb into the organism results in inhibition of delta-aminolevulinic acid dehydratase by binding to an allosteric site of the enzyme molecule. Human erythrocyte d-ALA is partly inhibited even at very low Pb levels like those occurring in a polluted urban environment. The degree of inhibition closely correlates to the concomitant level of blood Pb, thus rendering d-ALA analysis a useful exposure test and a qualitative tool in diagnosing Pb poisoning. Inhibition of the enzyme becomes mea-

surable a few days after the commencement of Pb exposure and persists for many years after the cessation of exposure to the metal. Specificity of the test appears to be free from interfering agents and other clinical conditions that might give positive reactions. Although the biological significance of d-ALA inhibition is unknown, it is suggested that the developing brain may be a site where such inhibition interferes with essential biochemical reactions. (Author summary modified)

44597

APTIC NO. 67541

Talisayon, S. D.

LOW-LEVEL AIR POLLUTION EFFECTS ON EXPERIMENTAL ANIMALS: A REVIEW. *Cornell Univ., Ithaca, N. Y.*, Cornell Energy Project, National Science Foundation Contract GI-29903X, Rept. 72-11, 20p., April 1972. 61 refs.

NTIS: PB 228002

Results are reported from a survey of recent experimental studies on the effect of air pollutants on animals under chronic and low level conditions closely approximating present urban environments. Sulfur dioxide, at levels slightly above concentration maxima occurring in cities appears to impair the mechanical functions of the lung; while nitrogen dioxide, ozone, and other oxidant air pollutants at ambient levels can cause elevated respiratory rate and ultrastructural damage to the lungs and predispose the system to respiratory infection. The effects of particulates are also noted. The combination of filterable air pollutants in urban air is associated with predisposition to pneumonitis and bronchopneumonia, earlier onset of degenerative diseases, and depression of running activity. (Author abstract modified)

44598

APTIC NO. 67725

Tomokuni, Katsumaro and Masana Ogata

SIMPLE METHOD FOR DETERMINATION OF URINARY DELTA-AMINOLEVULINIC ACID AS AN INDEX OF LEAD EXPOSURE. *Clin. Chem.*, 18(12):1534-1536, 1972. 7 refs.

A simple method is described for the quantitative analysis of urinary delta-aminolevulinic acid. The 2-methyl-carboxy-4-(3-propionic acid) pyrrole, produced by the condensation of delta-aminolevulinic acid with ethyl acetoacetate, is almost completely extracted from an aqueous solution with ethyl acetate without resorting to ion-exchange column chromatography. The pyrrole is determined colorimetrically by treating an aliquot of the extract with a modified Ehrlich's reagent. The determination of urinary delta-aminolevulinic acid can be used to assess lead poisoning. (Author abstract modified)

44599

APTIC NO. 63555

Zorn, Hans

LEARNING OF CONDITIONED REFLEXES OF THE WISTAR RAT UNDER INTERMITTENT ACTION OF LOW CO CONCENTRATIONS. *Staub, Reinhaltung Luft*, 32(4):36-38, April 1972. 6 refs.

The influence of an intermittent long-time exposure to a concentration of 150 ppm carbon monoxide on the ability to learn conditioned reflexes was investigated with Wistar rats. Half the 80 rats employed and divided into intelligence groups were exposed to this concentration at night five times for 8 hr weekly. The carboxyhemoglobin level in the blood of these animals increased to 7-13%. After an adequate interval for CO elimination, the rats exposed and the control animals were trained to develop a conditioned flight reflex. At a later date, the results were ascertained. With regard to the progress in learning this action, the CO-exposed animals showed a significant reduction in performance (longer learning time, more frequent deficient behavior, and inclination for stupor and anxious denial). (Author summary)

44600

APTIC NO. 63943

Himeji City Medical Assoc. (Japan)

REPORT OF THE SURVEY ON EFFECTS OF AIR POLLUTION ON HUMAN HEALTH IN HIMEJI CITY (OKAYAMA PREF.). (*Himeji-shi nicokeru taiki osen no kenko ni oyobosu eikyo chosa hokokusho*). Text in Japanese. 84p., 1972.

The status of air pollution in Himeji City, results of a survey on specific diseases of the inhabitants, results of an investigation of the diseases which were the subjects of National Health Insurance, and a survey of the influence of air pollution primary schoolchildren are given. The falling dust, floating dust, and sulfur oxides in the city have yearly decreased since 1969 and are now far lower than the national standards. The spread of air pollution was not detected in 1972. Both nitric oxide and nitrogen dioxide did not show any tendency of decreasing in 1971, and were especially high in winter. High oxidant concentrations appeared in July, August and September, which caused the first two cases of photochemical smogs. Notwithstanding the decrease of air pollution, no decrease of patients suffering from chronic bronchitis, asthmatic bronchitis, and asthma was recognized, and in some districts the morbidity of these diseases increased in 2 consecutive years. The survey on children by peakflow meter showed no abnormal findings, as well as the frequency of school absence, suggesting that there were no recognizable effects of air pollution on the children's health. The morbidity of children's asthma increased from 0.86% in 1971 to 1.35% in 1972, and these high morbidities are concentrated in the urban areas where the concentration of aerial sulfur oxides and the amount of dust fall were relatively larger.

1971

44601

APTIC NO. 65865

McBean, Lois D., Mohsen Mahloutji, John G. Reinhold and James A. Halsted

CORRELATION OF ZINC CONCENTRATIONS IN HUMAN PLASMA AND HAIR. *Amer. J. Clin. Nutr.*, vol. 24:506-509, May 1971. 11 refs.

Hair and plasma zinc concentrations were determined by atomic absorption spectrophotometry during October 1968 in 75 Iranian children aged 6 to 12 years. Plasma zinc was 72 ± 12 micrograms/100 ml. This was significantly lower than that found in 26 American children aged 3 to 13 years. The mean hair zinc content was 199 ± 22 ppm, significantly greater than the 163 ± 22 ppm reported for Iranian village control males of a similar age group in another study. The correlation coefficient between the zinc content of paired plasma and hair samples had an absolute value of 0.05 and was not statistically significant. These data do not support the suggestion that the zinc content of the hair is a reliable indicator of body zinc stores in prepubescent children. (Author summary modified)

44602

APTIC NO. 67499

Voloder, Kata, Nikola Ivicic, and Bozena Svirig

DETERMINATION OF LEAD IN A MINUTE BLOOD SAMPLE BY THE SPECTROPHOTOMETRIC METHOD. *Mikrochim. Acta*, 1971:341-347, 1971. 17 refs.

An improved spectrophotometric method for the determination of lead in blood samples is described which enables smaller blood samples (2 ml) to be used. The mono-color dithizone method involves mineralizing the blood sample by wet oxidation with nitric acid and hydrogen peroxide, with the Pb content being determined spectrophotometrically as Pb dithizonate after extraction with dithizone from the mineralized solution. Aside from the advantage of requiring smaller blood samples, the method displays increased sensitivity and rapidity of determination. Although the precision of the modified method is somewhat lower than that of the original method, sufficiently precise determinations can be made for practical toxicological

purposes. The reliability of the method can be checked if parallel samples are run whenever possible, if blood samples with and without addition of Pb are not analyzed simultaneously, and if the standard sample (Pb concentration of 25 micrograms/100 ml) and blank test are subjected to the same procedure as blood itself.

1970

44603

APTIC NO. 70026

Goppers, Velta and Harold Paulus

TOXIC EFFECTS OF ALLERGENIC MACROMOLECULAR COMPOUNDS ON GUINEA PIGS AND MICE.

Am. Ind. Hyg. Assoc. J., vol. 31:210-212, 1970. 7 refs. (Also: *Ecological and Biological Effects of Air Pollution*. Vol. IV, New York, MSS Information Corp., 1973, p. 96-101.)

Guinea pigs and mice were exposed intraperitoneally and intravenously to certain amounts of two compounds separated from airborne particles. The particles came partially from natural products such as grains and pollens, and were distributed by nature itself, or were contained in emissions from the grain industry. The exposed animals suffered convulsions, then recovered, and after a second exposure developed antibodies. There were changes in the protein molecules of blood samples from the exposed animals. (Author summary modified)

44604

APTIC NO. 64377

LaVerne, Albert A.

CARBON DIOXIDE THERAPY, HEALING, AND AIR POLLUTION. A MORE EFFECTIVE RAPID COMA TECHNIC FOR PSYCHIATRIC DISORDERS.

Behavioral Neuropsychiat., 2(3-4):10-24, June-July 1970. 61 refs.

Conventional therapeutic treatment for various disorders might be improved if therapy occurred in pollution-free air, rather than normal, polluted air. High concentrations of carbon dioxide (over 40%) and oxygen mixtures can induce rapid coma (Rapid Coma Technic). More than 200,000 such treatments have been safely administered since 1952. The treatments are therapeutically more effective and less anxiety-producing than the lower CO₂ concentrations used by the prolonged coma (Meduna) method previously used. The new method used in this study, a modified Rapid Coma Technic, consists of first aerating the patient by inhalation of 100% oxygen for 10-20 min; then, without allowing breathing of room air and while the patient is fully conscious, he breathes deeply 4-10 breaths of a mixture of 75% CO₂ and 25% O₂. The face mask is then removed while the patient is still frequently unconscious. Immediately thereafter, he lapses into unconsciousness and hyperventilates, with the return to full consciousness several minutes later. He may then abreact by narrating a dream experience which he may describe as unpleasant, pleasant, or exhilarating. Treatments are administered three times weekly, for a series of 20 or more treatments. The new method is safe and clinically effective in 35-45% of a group of 250 patients in acute and chronic psychiatric disorders of the neurotic and psychotic variety. Clinical improvement appears to be significantly greater if the patient is administered pollution-free air for 10-20 min immediately post-treatment. Control patients fail to manifest significant clinical changes. A hypothesis and rational are postulated regarding pollution versus healing. Any toxin inhaled from polluted air that passes the blood brain barrier or the cell membrane of any tissue will deleteriously affect cerebral or organ tissue metabolism according to inherent and adaptive histological susceptibility, tolerance, resistance, and immunity factors. In general the clinical or healing response to a therapeutic agent equals (resistance of tissue to toxin divided by the susceptibility of tissue to toxin) times (a constant which differs for each tissue divided by the concentration of toxins). (Author abstract modified)

44605

APTIC NO. 67761

Nikitina, L. S.

THE STATUS OF CERTAIN OF THE MINERAL METABOLISM INDICES IN PERSONS WORKING UNDER CONDITIONS INFLUENCED BY BERYLLIUM COMPOUNDS. (Sostoyaniye nekotorykh pokazateley mineral'nogo obmena u lyudey, rabotayushchikh v usloviyakh vozdeystviya soyedineniy berilliya). *Gigiena Truda i Prof. Zabollevaniya*, vol. 14:52-54, May 1970. 6 refs. Translated from Russian. Translation Consultants, Ltd., Arlington, Va., 8p.

The metabolism of persons who appeared to be healthy, but who were in constant contact with beryllium compounds, was studied. The content of magnesium, chlorides, inorganic phosphorus, and calcium in the blood serum of 50 workers in the shop machining beryllium disks in an X-ray machine plant, and of 21 persons with no contact with toxic substances, was determined. The values of the ions of the bivalent metals in the most important body reactions, their competitive interrelationship with each other, and their capacity to form colloidal phosphate compounds in blood were determined. Although the work area was polluted with soluble and insoluble beryllium compounds during all operations, clinical and X-ray examinations failed to turn up any industrial diseases in any of the workers. Beryllium concentrations in the blood correlated with degree of contact of the workers. The beryllium workers had a reduced level of magnesium in the blood, the level depending on the degree and duration of contact with the toxic substance. Other indices of mineral metabolism (calcium, inorganic phosphorus, blood chlorides) remained within the limits of normal magnitudes.

44606

APTIC NO. 70031

Savel, Herbert

CLINICAL HYPERSENSITIVITY TO CIGARETTE SMOKE. *Arch. Environ. Health*, vol. 21:146-148, 1970. 14 refs. (Also: *Ecological and Biological Effects of Air Pollution*. Vol. 4, New York, MSS Information Corp., 1973, p. 128-134.)

The syndrome of clinical response to cigarette smoke in eight nonsmokers is described in association with evidence of in vitro hypersensitivity to cigarette smoke. Exposure of the peripheral blood lymphocytes of these individuals to cigarette smoke in vitro led to a stimulation of lymphocyte transformation as measured by uptake of tritiated thymidine. There was a similar stimulation of peripheral blood lymphocytes in association with clinical hypersensitivity to such antigens as tuberculin, drugs, viruses, and pollens. Cigarette smoke is an antigen to which man may develop sensitivity and may be responsible for upper respiratory tract distress in sensitized individuals.

44607

APTIC NO. 67731

Valentin, H. and H.-J. Woitowitz

HEALTH HAZARDS DUE TO ASBESTOS: SIGNIFICANCE, ENVIRONMENTAL HAZARDS, AND FORECAST. (*Gesundheitliche Risiken durch Asbest: Bedeutung, Umweltgefahren und Prognose*). Text in German. *Fortschr. Med.*, 88(33):1329-1332, 1970. 39 refs.

Epidemiological data demonstrating the health hazards due to asbestos in occupational and general exposure is reviewed. The nearly ubiquitous occurrence of asbestos is partly due to the wear of asbestos-containing brake linings in automobiles. As demonstrated by lung autopsies, asbestos bodies are present in nearly 50% of the occupationally non-exposed population. Unlike the incidence of pneumoconioses in general, that of asbestosis has shown an upward trend for years. Lung cancer, mesothelioma, neoplasia of the pleura, and possible carcinoma of the stomach occur in subjects occupationally exposed to asbestos. In such subjects, the incidence of lung cancer is increased tenfold by smoking.

44608

APTIC NO. 67732

Woitowitz, H.-J. and H. Valentin

HEALTH HAZARDS DUE TO ASBESTOS: PATHOGENESIS AND ALVEOLOCAPILLARY BLOCKADE SYNDROME. (*Gesundheitliche Risiken durch Asbest: Pathogenese und alveolo-kapillares Blocksyndrom*). Text in German. *Fortschr. Med.*, 88(33):1333-1336, 1970. 35 refs.

Health hazards due to asbestos in general, as well as pathogenesis and the alveolocapillary blockade syndrome in asbestosis are described. The biological effects of asbestosis may be due to the chemical effects of magnesia, silica, nickel, chromium, cobalt, copper, manganese, calcium, and adsorbed organic substances such as oils and waxes, or to the surface properties characterized by a slight excess of hydrogen of the superficial hydroxyl groups. Electron microscopic studies revealed the biological effect even of very small asbestos particles, and the subsequent destruction of several phagocytes by phagocytized asbestos needles. Comparative experiments on subjects exposed occupationally to asbestos for up to 40 yrs and over and on a test group revealed no relationship between asbestosis and arterial hypoxemia prior to and during muscular stress.

1969

44609

APTIC NO. 67446

Lee, Anna M. and Joseph F. Fraumeni, Jr.

ARSENIC AND RESPIRATORY CANCER IN MAN: AN OCCUPATIONAL STUDY. *J. Nat. Cancer Inst.*, 42(6):1045-1052, June 1969. 28 refs.

The mortality experience of 8047 white male smelter workers exposed to arsenic trioxide during 1938-1963 was studied and compared with mortality statistics from the white male population of the same states to clarify the role of arsenic in human carcinogenesis. Smelter workers showed an excess total mortality which was mainly due to malignant neoplasms of the respiratory system and diseases of the heart. Analysis of a threefold increase in respiratory cancer in relation to the length of employment and degree of exposure to arsenic, sulfur dioxide, and other elements in the smelter revealed an eightfold excess of respiratory cancer among employees working more than 15 years in areas heavily exposed to arsenic. The respiratory cancer excess showed a gradient in proportion to the degree of exposure to arsenic and sulfur dioxide. The findings support the hypothesis that inhaled arsenic is a respiratory carcinogen in man, but the influence of sulfur dioxide or unidentified chemicals, varying concomitantly with arsenic exposure, cannot be discounted as a contributor. (Author abstract modified)

1967

44610

APTIC NO. 67445

Frost, Douglas V.

ARSENICALS IN BIOLOGY - RETROSPECT AND PROSPECT. *Fed. Proc.*, 26(1):194-208, Jan.-Feb. 1967. 148 refs. (Presented at the Federation of American Societies for Experimental Biology, Annual Meeting, 50th, Atlantic City, N. J., April 14, 1966.)

A review on the biological action of arsenic is presented. Topics considered include: the toxicity of different forms of arsenic in man and animals, the quantitative and qualitative aspects of arsenic in nutrition, confusion between arsenic and selenium toxicities, the Hutchinson hypothesis of arsenic-induced palmar and plantar keratoses, industrial exposure to arsenic trioxide, the association of arsenic with tar cancer, carcinogenesis studies in animals, the relationship of arsenic in metabolism to phosphorylation, the Warburg hypothesis of arsenious acid as a respiratory poison, efforts to reduce arsenic in foods and food additives, arsenic versus lead tolerance, and

the relation of arsenic to phosphorus in the integrity of bones and teeth. Arsenicals appear to differ widely in toxicity, with the trivalent forms specifically blocking lipase dependent enzymes. There appears to be an arsenic cycle in nature, and the complete ubiquity of arsenic and its relation to phosphorylation suggest that it may catalyze energy-transfer reactions. A smoker consuming 2.5 packs of cigarettes a day inhaled less than 10% of the level of arsenic inspired in New York City air, even without smoking.

1966

44611

APTIC NO. 67448

Schroeder, Henry A. and Joseph J. Balassa

ABNORMAL TRACE METALS IN MAN: ARSENIC. *J. Chronic Diseases*, vol. 19:83-106, 1966. 66 refs.

Laboratory and field data are reported as part of a survey of arsenic in the biosphere. Arsenic is found in soils, most foods, many waters, almost all plants and plant products tested, and in most animal tissues. Two forms of arsenic exist in the environment, a nontoxic pentavalent form and a toxic trivalent form. The pentavalent form is a normal constituent of food and may perform some unknown physiological function. It is not inhibitory to most enzymes and can substitute for phosphate in some phosphorylases. Trivalent arsenic, the principal form produced commercially, is toxic and chelates with dithiol groups, thus inhibiting those enzymes dependent on such groups. It accumulates in the mammalian body, is excreted largely from the intestine, and is a contaminant of soils and foods because of its use in herbicides and pesticides. The trivalent inorganic form is slowly oxidized to the pentavalent form in the upper layers of the earth's crust and in the mammalian body. There is no evidence that natural arsenate causes any diseases of man, and definitive evidence that inorganic arsenite is a cause of experimental or human cancer is lacking, although both its acute and chronic toxicity are known. (Author summary modified)

1964

44612

APTIC NO. 64276

Goldsmith, John R.

AIR POLLUTION AND HEALTH. *Preprint, California State Dept. of Public Health, Berkeley, Air Pollution Medical Studies*, 11p., 1964.

The health effects of air pollution were discussed at the Air Pollution Medical Research Conference. Reports presented are described. A highlight of the conference was a report on the secretion, transport, and disposition of respiratory tract mucus and the effects of pollution on mucus. Epidemics of asthma and the relationship of asthma to pollution and meteorology were discussed. A series of papers were presented relevant to long-term air pollution effects discussing military personnel who developed respiratory disease while in the Yokohama-Tokyo area, persons in two communities with and without air pollution, respiratory disease in London and rural England compared with the eastern U. S., respiratory disease in Los Angeles and San Francisco, and postmen in New York. Another study compared monozygotic twins with respect to various symptom categories, smoking habits, and place of residence. A statistical study was made of cardiovascular disease mortality in Nashville in relation to socio-economic factors and air pollution. A series of studies on experimental human exposure was presented including effects of peroxyacetyl nitrate on exercising students, of diesel exhaust on mechanical properties of the lung, of ozone compared with cigarette smoke in humans, and of inhalation of sulfur dioxide. A series of studies on experimental animals was reported including studies on effects of SO₂ on ciliated epithelium in the rabbit trachea, effects of nitrogen dioxide on oxygen uptake of the lung homogenate and other organs of guinea pigs and on circulating antibody relationship to lung proteins, pulmonary fibro-

sis in rats after exposure to phosgene, and effects on ozone and aldehydes on rabbits. Papers also reported on reactions of vegetation to pollution, including effects caused by peroxyacetyl nitrate and ozone. Other papers discussed the effects of photochemical reaction products on glutamic dehydrogenase activity, toxicity of polynuclear carcinogens, effects of pollution and car exhaust on tissue cell cultures, trace metals in bones, carboxyhemoglobin levels in humans, role of lymphocytes in infiltrative lung disease, the role of agricultural dusts in producing infiltrative lung disease, and epidemiological studies.

1963

44613

APTIC NO. 67449

Cmarko, V.

HYGIENIC PROBLEMS OF ARSENIC EXHALATION OF ENO PLANTS. (*Hygienická problematika arzenových exhalací zavodu eno*). *Text in Czech. Cesk. Hyg. Prague*, vol. 6:359-363, 1963. 3 refs.

The effect of arsenic emissions from a heat-electric works on the surroundings is discussed. Extinction of bee families resulted in a reduction of agricultural products due to lack of pollination. Increased quantities of arsenic compounds were found in biologic material from cattle, in the hair and urine of employees of the electric works, and in the area of a plant manufacturing building panels. A loss of work ability among employees in the affected area was also noted.

1954

44614

APTIC NO. 64121

Dement, Jack A.

NEW HORIZONS IN CANCER CONTROL: BIOPHYSICAL VIEWS OF THE CANCER PROBLEM, ITS CAUSE AND CONTROL. *Ann Arbor, Mich., Univ. Microfilms, Ltd., Pub. 9929, 1954, 252p. 185 refs.*

Factors causing cancer are reviewed. The theory presented leaves much to be desired and will undoubtedly undergo revision and reemphasis. New views and evidence of an electrophysical genesis of cancer are discussed. The effects of chronic irritation such as air pollution and industrial exposure to pollutants on tumors and tissues are reviewed. Organic and metal carcinogens, carcinogens and cholesterol as a transducer, and transducer therapy are discussed. A generalized vector equation is described for cancer genesis. The cellular resonance principle in the transduction theory is also discussed.

1931

44615

APTIC NO. 67440

Miesner, H.

DAMAGES TO ANIMALS BY INDUSTRIAL EMISSIONS.

(*Schädigung der Tierwelt durch Industrie und Technik*). *Text in German. Deut. Tierärztl. Wochenschr.*, 39(22):340-345, May 1931. 25 refs.

Damages and health hazards due to air pollutant emissions and other environmental pollutants in connection with industrial activity are surveyed. Sulfur dioxide, arsenic trioxide, and lead, emitted by ore smelters, can cause damage to plants and animals either directly or by ingestion of contaminated plants. Sulfur dioxide causes reduction of the magnesium, phosphoric acid, and calcium levels in plants, and osteomalacia due to depletion of the calcium reserves in animals. Arsenic is responsible for colic, emesis, fatty generation in the liver, cachexia, eczema, and overall asthenia in cattle. Lead, accumulating in the liver, bones, kidneys, spinal cord, intestines, and muscles, causes gastric troubles and convulsions in acute poisoning, and general depression, abortion, colic, muscular

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pains, epilepsy, and pareses in chronic poisoning. Fluorine compounds, and especially hydrofluoric acid, as emitted by fertilizer plants, affect the bones due to the mobilization and depletion of calcium.

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1974

44616

APTIC NO. 67643

Crecelius, Eric A., Carl J. Johnson, and George C. Hofer

CONTAMINATION OF SOILS NEAR A COPPER SMELTER BY ARSENIC, ANTIMONY AND LEAD. *Water, Air, Soil Pollut.*, 3(3):337-342, Sept. 1974. 13 refs.

Stack dust from a large copper smelter near Tacoma, Washington has contaminated soil in the area with arsenic, antimony, and lead. Within 5 km of the smelter, 380 ppm (dry weight) arsenic, 200 ppm antimony, and 540 ppm lead were measured in the surface soil (0-3 cm). Plants grown in these soils may be affected. The consumption of plants coated with this heavy metal-rich dust may be of concern. Standard orchard leaves in the area were collected. The following mean concentrations and standard deviations were determined for orchard leaves: 10.5 + or - 0.5 ppm As and 3.5 + or - 0.5 ppm Sb. (Author abstract modified)

44617

APTIC NO. 66358

Doorn, Wouter G., van

BIOELECTRIC RESPONSE AND PHOTORESPONSE CHANGES AFTER SUBLETHAL APPLICATIONS OF SULFUR DIOXIDE TO ZINNIA ELEGANS. Preprint, Iowa State Univ. of Science and Technology, Ames, Dept. of Horticulture, 54p., 1974. 39 refs.

Laboratory experiments investigated bioelectric potential (BEP) response and BEP photoreponse changes in *Zinnia elegans* (var. Canary yellow) leaf to sudden, sublethal sulfur dioxide exposures, using the slope and amplitude of the resulting first waveform trough as a criterion for SO₂ action. Polyethylene-lined test enclosures equipped with fluorescent lamps, metal electrode supports, and an exterior black cloth for dark tests were utilized as whole-plant SO₂ exposure chambers to allow for the monitoring of both initial and subsequent SO₂-induced plant BEP changes and photoreponses; this was in contrast to pioneering BEP experiments with *Zinnia elegans* by fellow investigator where plants were first fumigated and then lab-tested sequentially for BEP photoreponse, resulting in a lack of BEP response data during actual fumigation. Low-impedance, non-polarizable, non-phytotoxic silver/silver chloride electrodes were placed in 2 cm long polyethylene plastic tubes filled with a 2% (by weight) agar plus 0.1 N potassium chloride solution in aquadest and were connected to a Grass polygraph, with the strip chart speeded up to 1 cm/sec for more-detailed readout. Amplitude sensitivity settings of either 5 or 2 mV/cm were used, and the electrode placement with respect to the upper and lower leaf sides was offset by 2 cm. Sublethal SO₂ injection under constant light conditions caused a BEP oscillation similar to that resulting from a light-off response but with a definitely lowered initial stationary BEP level for SO₂ concentrations of 7-100 ppm. Light-on and light-off plant photoreponses were also changed following SO₂ application. Measurement of BEP was not an indication of either stomatal opening or thermocouple-detected temperature differences between upper and lower leaf sides. The method offers promise as an indicator for sublethal SO₂ action on plants under field conditions since it utilizes relatively simple equipment, does not destroy the plant, and results in a reproducible and concentration dependent response for SO₂.

44618

APTIC NO. 67644

Dunning, John A., Walter W. Heck, and David T. Tingey

FOLIAR SENSITIVITY OF PINTO BEAN AND SOYBEAN TO OZONE AS AFFECTED BY TEMPERATURE, POTASSIUM NUTRITION AND OZONE DOSE. *Water, Air, Soil Pollut.*, 3(3):305-313, Sept. 1974. 16 refs.

Pinto beans and soybeans were exposed to ozone to determine the interactions of growth temperature, exposure temperature, potassium nutrition, and doses of ozone on their foliar sensitivity. Pinto beans developed more foliar injury than soybeans. Pinto beans were most sensitive when grown and exposed at 28 C. Growth and exposure temperature interacted in the development of foliar injury on pinto beans, but only growth temperature influenced the amount of foliar injury on soybeans. Both species developed more foliar injury when grown with low potassium nutrition. There was no relationship between foliar injury and reducing sugars or the sucrose content of the leaves. (Author abstract modified)

44619

APTIC NO. 67681

L'vov, Y. A., N. V. Vasil'ev, and G. M. Ivanova

STUDY OF THE DYNAMICS OF INDUSTRIAL DUST FALLOUT OVER LARGE AREAS. (Metod issledovaniya dinamiki vypadeniy promyshlennoy pyli na bol'shikh ploshchadyakh). Text in Russian. *Gigiena i Sanit.*, no. 8:97-98, 1974.

A method for the study of the dynamics of the fallout of magnetic and silicate dust of industrial origin over large areas by means of biological indicators is described. *Sphagnum fuscum* (moss) growing in bogs and retaining dust particles is used for this investigation. The samples taken from the upper 50-55 cm layer are washed and incinerated, after which the ash is washed with water for the leachout of water-soluble particles, and finally dried. The dried residue is observed under the microscope. The presence of spherical particles ranging from 10 to 150 microns in diameter is indicative of industrial dust fallout. The observation of samples from different depth permits the dynamic study of dustfall over large areas.

44620

APTIC NO. 67693

Leone, Ida A. and Dov Green

A FIELD EVALUATION OF AIR POLLUTION EFFECTS ON PETUNIA AND POTATO CULTIVARS IN NEW JERSEY. *Plant Disease Repr.*, 58(8):683-687, Aug. 1974. 10 refs.

Filtered and nonfiltered circular, open-top field chambers were used to evaluate air pollution effects (primarily oxidants such as ozone) on petunia, potato, and tobacco cultivars. Differences between filtered and nonfiltered tobacco cultivars were observed by the second day, with the two oldest leaves of each plant in the nonfiltered chamber exhibiting typical fleck symptoms and the third and fourth oldest leaves in the filtered chamber also exhibiting injury. White Cascade, Apollo, and Snow Magic varieties of petunia all exhibited interveinal chlorosis and typical oxidant injury in both chambers, while Joy, Pink Joy, Capri, and Purple Plum did not exhibit injury. Fiesta developed chlorosis only in the ambient chamber. Kennebec potatoes in the nonfiltered house had a moderate degree of lower surface fleck and the younger leaves had a slight amount of curling. There was no curling and only a slight lower surface fleck on leaves in the filtered house. Although there were general trends toward decreased growth in the ambient chamber, white-flowered petunia varieties which exhibited signs of air pollution damage suffered no significant decrease in growth in the unfiltered chamber. The seemingly contradictory results with respect to foliar injury and growth effects in petunia were explained on the basis of threshold concentrations for the various cultivars. A slight amount of zone contamination in the ambient chamber was responsible for injury effects observed for the more sensitive varieties of petunia.

44621

APTIC NO. 67569

Mitsudera, M.

MONITORING OF ENVIRONMENT. (Kankyo no kanshi). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(9):68-74, Sept. 1974.

The amount of pollutants discharged has now exceeded the environments natural ability to purify itself. The effect of urbanization, is traced especially the degeneration of plants and animals in Tokyo. One of the methods of monitoring plants is remote sensing with multi-band photography and multi-spectroscanning. There is a correlation between the sulfur content of tree leaves and multi-band photographs on red pine trees with a correlation coefficient of -0.862.

44622

APTIC NO. 67676

Miyamoto, S., H. L. Bohn, J. Ryan, and M. S. Yee

EFFECT OF SULFURIC ACID AND SULFUR DIOXIDE ON THE AGGREGATE STABILITY OF CALCEROUS SOILS. Soil Sci., 118(5):299-303, 1974. 12 refs.

The water-stable soil aggregates were measured for two non-calcerous, two sodic-calcerous, and six calcerous soils as affected by sulfuric acid and sulfur dioxide treatment. The aggregate stability, the percentage of silt and clay remaining as a greater than 50 micron aggregate, decreased with increasing amounts of H₂SO₄ and SO₂. When H₂SO₄ was applied at 1.3 times the acid-titratable basicity of the soils, the aggregate stability decreased on the average from 62 to 17% in the calcerous soils and from 45 to 32% in the noncalcerous soils. The relative aggregate stability, the ratio of the destroyed portion of the aggregate to its total, decreased similarly with relative acidification for all the calcerous soils. Drying at 105 C for 24 hr after the H₂SO₄ further destroyed approximately 10% more aggregate at 20% neutralization of the basicity. The sorption of SO₂ from moist streams also reduced the aggregate stability, but the reduction was less than equivalent amounts of H₂SO₄ solutions. (Author abstract)

44623

APTIC NO. 67461

Oshima, R., O. C. Taylor, and E. A. Cardiff

SEVERE AIR POLLUTION EPISODE IN SOUTH COAST BASIN. Calif. Agr., 28(2):12-13, Feb. 1974.

The photochemical air pollution episode that occurred between Nov. 8 and 11, 1973 in the south coast air basin of California, was unusual because the accompanying weather conditions and the resulting injury to vegetation did not fit into the pattern normally associated with attacks of ozone and peroxyacetyl nitrate (PAN). The injury to leafy vegetables was worse than usual, considering the concentration of phytotoxins measured. Crop damage symptoms were generally of the type attributed to PAN, but the overall syndrome differed sufficiently to make it apparent that the incident was unique. Concentrations of oxidants differed markedly from one region to another. There was strong evidence that toxic levels of peroxypropynyl nitrate (PPN), a homologue of PAN, were present. In Orange County, where the most severe injury occurred, the smog contained a mixture of PAN, PPN, and O₃. Elevated levels of toxicants persisted continuously for up to 40 hours. Thus, the PPN may have been the cause of the severe plant damage. Another possible explanation is that susceptibility of plant tissues may have been increased significantly by favorable weather conditions before and during the prolonged exposure. A new toxicant may have developed in the polluted atmosphere, perhaps in response to changes in primary pollutants being discharged.

44624

APTIC NO. 67784

Toshkov, A. S., M. M. Shabanov, and N. I. Ibrishimov

ATTEMPTS TO USE BEES TO PROVE IMPURITIES IN THE ENVIRONMENT. Dokl. Bolg. Akad. Nauk, 27(5):699-702, 1974. 1 ref.

The effects of environmental pollutants on bees were studied in the area of a copper works in Pirdop and of a metallurgical work in Pernik, Bulgaria. The number of destroyed and affected bee families, the effects on herbaceous and arboreal vegetation, and the amounts of copper and zinc in pollen, honey, and bees were determined. When the copper plant emitted a large amount of pollution during a plant breakdown, 59 bee families perished completely, 69 lost 90% of their bees, 48 lost 80%, 56 lost 70%, 26 lost 60%, 25 lost 50%, and 15 were affected to a lesser extent. Bees which survived the poisoning were very weak. Pollen from bees living near the plant had high copper concentrations (788.72 gamma/g); honey had lower amounts (4.21-14.5 gamma/g). High concentrations of copper in the pollen were toxic to the bees, and were the main cause of death. Zinc concentrations in the pollen from bees near the metallurgical plant reached 711.11 gamma/g, while the quantities were appreciably lower in other regions of the country. Concentrations of zinc and copper in the honey were 10-100 times less than those in the pollen. Phosphorus content in the pollen was about four times higher than in the honey. The poisonous pollutants were transported by the bees to the hive mainly by means of the pollen. The high sensitivity of the bees to various poisons makes them useful as biological indicators of pollution.

1973

44625

APTIC NO. 67583

Grill, Dieter and Hermann Esterbauer

QUANTITATIVE DETERMINATION OF WATER SOLUBLE SULFHYDRYL COMPOUNDS IN HEALTHY AND SULFUR DIOXIDE-DAMAGED NEEDLES OF PICEA ABIES. (Quantitative Bestimmung wasserlöslicher Sulfhydrylverbindungen in gesunden und SO₂-geschädigten Nadeln von Picea abies). Text in German. Phyton (Austria), 15(1-2):87-101, Aug. 30, 1973. 18 refs.

The concentration of water soluble sulfhydryl groups in extracts of sulfur dioxide-exposed and normal spruce needles was determined colorimetrically and by amperometric titration. The stability of the SH groups in the extracts was also examined. Sulfhydryl components identified were cysteine and glutathione in proportions of 0-5% and 95-100%. Sulfhydryl contents of SO₂-fumigated spruces were as much as four times SH levels in trees grown in regions with clean air. Sulfite was not identified in either normal or damaged tree needles.

44626

APTIC NO. 67457

Liang, Ta

SEMI-ANNUAL STATUS REPORT OF THE REMOTE SENSING PROGRAM. APPENDIX D. PLANT SENSITIVITY TO ATMOSPHERIC POLLUTION. Cornell Univ., Ithaca, N. Y., Remote Sensing Program, National Aeronautics and Space Administration Grant NGL 33-010-171, 33p., Dec. 27, 1973. 85 refs.

The relative sensitivity of various forms of vegetation to ozone, sulfur dioxide, hydrogen fluoride, nitrogen oxides, peroxyacetyl nitrate, ethylene, 2,4-dichlorophenoxyacetic acid, chlorine, hydrogen chloride, mercury, ammonia, and hydrogen sulfide was compiled. Sensitivity data were incomplete; in certain cases, different sensitivity ratings were encountered and are listed.

44627

APTIC NO. 67539

Spedding, D. J. and W. J. Thomas

EFFECT OF SULPHUR DIOXIDE ON THE METABOLISM OF GLYCOLLIC ACID BY BARLEY (HORDEUM VULGARE) LEAVES. Aust. J. Biol. Sci., vol. 26: 281-286, 1973. 16 refs.

Barley leaves (Hordeum vulgare) treated in exposure chambers with 5 ppm sulfur dioxide in the presence of radiocarbon-labeled carbon dioxide showed an accumulation of radiocar-

bon-labeled glycollic acid and radiocarbon-labeled sugar phosphates together with a decrease in radiocarbon-labeled sucrose and radiocarbon-labeled pigments when compared with untreated leaves. Dissolution of the SO₂ in the aqueous phase within the leaf appeared to lead to the formation of alpha-hydroxysulfonates which inhibited the enzyme glycolate oxidase. The observed changes in radiocarbon distribution of sucrose, sugar phosphates, and glycollic acid also appeared to be possibly related to such an inhibition. Glycolate oxidase activity might possibly be affected by atmospheric SO₂ before photosynthetic CO₂ fixation. (Author abstract modified)

44628

APTIC NO. 67695

Zuber, R., P. Moeri, and E. Bovay

LEAD UPTAKE BY THE ROOTS OF PLANT. STUDY OF THE ACTION OF LEAD ON ENZYME ACTIVITY.

(L assorbimento del piombo da parte della pianta tramite la radice. Con studio particolare sull'attività enzimatica). Text in Italian. Schweiz. Landwirt. Forschung, 12(4):291-306, 1973. 9 refs.

Experiments were performed to determine the relationship between lead uptake by the roots of Italian Raygrass and crop yield and to assess the effectiveness of peroxidase activity assay as an indicator for invisible plant damage. Three acid soils with different pHs and different physical and chemical properties were mixed with equal amounts of fertilizer, different doses of lead carbonate, and increasing amounts of calcium carbonate in order to obtain an increasing scale of soil pH. Crop yield increased as the amount of lead in plant tissue decreased for increasing alkalinity of the soils used. Minimum absorption at increased pH values was most pronounced with the highest concentration of added lead. Determination of peroxidase activity by spectrophotometric absorption measurement of para-phenylenediamine oxidized by peroxide in the presence of peroxidase proved to be an indicator for plant damage. A decrease in lead resorption with increasing soil pH in connection with increasing crop yield corresponded to a decrease in peroxidase activity.

1972

44629

APTIC NO. 64223

Linzon, S. N.

EFFECTS OF SULPHUR OXIDES ON VEGETATION.

Forestry Chronicle, 48(4):182-186, Aug. 1972. 34 refs. (Presented at the Air Pollution Control Association, Pacific Northwest International Section, Annual Meeting, Calgary, Alberta, 1971.)

The effects of sulfur oxides on vegetation are discussed, including a study made on the effects of sulfur dioxide on forests in the Sudbury (Ontario) mining district. Sulfur dioxide, entering leaves mainly through the stomata, is toxic to the mesophyll cells primarily due to its reducing properties. Acute leaf injury is caused by absorption of high concentrations of SO₂ in a relatively short time, resulting in a rapid accumulation of sulfite which is toxic to the metabolic processes taking place in the mesophyll cells. Chronic injury is caused by long-term absorption of SO₂ at sub-lethal concentrations. The sulfite is oxidized to sulfate at about the same rate that the gas is absorbed. When sulfate accumulates beyond a threshold value tolerable to the plant cells, chronic injury occurs. Sulfate is about 30 times less toxic than sulfite. Three large nickel and copper smelters are located in the Sudbury region which together discharge daily into the surrounding atmosphere over 7000 tons of SO₂. Ten automatic SO₂ recording machines were set out to determine the concentrations, frequency, and duration of atmospheric SO₂ at strategic locations in the area. White pine trees were extensively damaged by sulfur fumes up to 25 mi northeast of Sudbury. Beyond this distance, the condition of white pine improved remarkably, where the concentration of atmospheric SO₂ was consistently lower than 0.25 ppm. Toxic tolerances of various vegetation are listed.

44630

APTIC NO. 67504

Mihaljovic, Ljubisa

EFFECT OF SULPHUR DIOXIDE ON VEGETATION.

(Dejstvo sumpordoksida na vegetaciju). Text in Serbo-Croatian. Hemijska Ind., no. 7:1381-1386, 1972. 14 refs.

The effect of sulfur dioxide on vegetation and the protective role of vegetation in terms of mechanical purification of the atmosphere are considered. Topics covered include: acute and chronic plant damage caused by SO₂, concentration of the gas necessary for inducing plant damage, the mechanism of such plant damage, the utilization of vegetation as a pollution indicator, biological methods for investigating air pollution, and the hygienic role of vegetation in the environment. The protective role of vegetation in relation to SO₂ is cited as consisting more in changing the direction of SO₂ spreading than in the ability of plants to bind harmful elements in their organism. Recultivation experiments with a series of herbs and leguminosae resistant to SO₂-damage are also described.

44631

APTIC NO. 67724

Schofield, Edmund

SOME CONSIDERATIONS ON THE POSSIBLE EFFECTS OF LOCAL AND GLOBAL SOURCES OF AIR POLLUTION ON LICHENS GRAZED BY REINDEER AND CARIBOU.

Preprint, Alaska Univ., Fairbanks, p. 90-94, 1972. 35 refs. (Presented at the International Symposium Reindeer/Caribou, 1st, Fairbanks, Alaska, Aug. 9-11, 1972.)

Considerable evidence shows that local sources of air pollution eliminate most lichens from the immediate vicinities of urban and industrialized areas in temperate regions. Pollutants such as sulfur dioxide appear to be transported hundred of kilometers from Britain and central Europe to Scandinavia. While there appear to be no reliable data or observations that link pollutants transported on a global scale to the deterioration of lichens there (primarily because the possibility has not been pursued), all of the ingredients necessary for lichen damage are present. Scattered comments and circumstantial evidence in the literature suggest that global pollution -- in addition to local pollution -- will adversely affect lichens grazed by reindeer and caribou. The accelerated industrialization of the Arctic makes this possibility of more than academic interest. The effects of SO₂ on algal chlorophyll, osmotic effects on lichens, effects of temperature inversions and ice fogs on lichens, global versus local pollution, and possible consequences for reindeer and caribou in the Arctic are discussed. (Author abstract modified)

44632

APTIC NO. 67480

Scholl, Gerhard

BIOLOGICAL METHOD FOR THE DETECTION OF FLUORINE COMPOUNDS IN THE AIR.

(Ein biologisches Verfahren zum Nachweis von Fluorverbindungen in Immissionen). Text in German. Mitt. Forst. Bundesvers., no. 97:255-269, 1972. 15 refs.

A biological method for the determination of airborne fluorine contamination is described. The method involves culturing certain grasses (*Lolium multiflorum* and *L. perenne*) which are relatively insensitive to fluorine compounds for a defined exposure interval in a standardized growth substrate with comparable nutrient and water supplies in the vicinity of a pollution source. The plant samples obtained at the end of the exposure are analyzed for their fluorine content, with the origin and distribution of airborne fluorine compounds being estimated on the basis of the determined fluorine values. The only plants suitable for the method are those which can accumulate the toxic substance in large amounts without the formation of visible external symptoms of damage or growth depression.

1965

44633

APTIC NO. 67487

Langer, G.

PARTICLE DEPOSITION AND REENTRAINMENT FROM CONIFEROUS TREES. PART II: EXPERIMENTS WITH INDIVIDUAL LEAVES. *Kolloid-Z. Z. Polym.*, 204(1/2):119-124, 1965. 13 refs.

Leaves from well watered coniferous trees were mounted on thin wires in a streamlined-flow-aerosol wind tunnel to study dust deposition and reentrainment for the leaves as well as factors affecting such events. Intertial deposition was the controlling parameter, with the efficiency of a cedar leaf being 6 and 0.5% for the edge and broadside positions, respectively, at a wind velocity of 1.30 m/sec using a 2.4 micron surface-diameter dust. Electrostatic effects were of no significance and did not improve adhesion. Collection on the back of the wires or leaves due to wake turbulence did not occur, and bounce-off upon deposition was not observed. Reentrainment did not occur up to 2 m/sec velocity in the 1.8 cm-diameter wind tunnel. A shadowing effect occurred in arrays of leaves, i.e., streamlines produced by one leaf gave a dust-free area on the leaf behind it.

1963

44634

APTIC NO. 67482

Bojsava, D.

THE EFFECTS OF ARSENIC ON THE BACTERIOLOGIC AND BIOLOGIC LIFE IN THE SOIL AND ON ITS SELF-PURIFYING FACULTY. (Vplyv arzenu na bakteriologicke a biologicke ozivenie pody a na jej samocistiacu schopnost). Text in Czech. *Cesk. Hyg. Prague*, 8(6):377-382, 1963. 7 refs.

Arsenic analyses of soil and vegetation from an area near a heat-electric works for arsenic showed conformity between arsenic increases in the soil and in vegetation. Experiments with mustard seed showed that germination and development were affected when soil contents ranged from 140-163.5 mg As/kg soil; soil samples containing 7-27.0 mg As/kg soil produced no unfavorable effect. The quantity of nitrogen in the soil was diminished with increasing arsenic quantities as was the number of bacteria. *Escherichia coli* was the most sensitive bacterium to arsenic. Soil protozoa showed diminished quantities in soils containing 163.5 mg As/kg soil. No worms were found in soil samples containing 140-163.5 mg As.

1956

44635

APTIC NO. 67483

Phillips, P. H.

THE EFFECTS OF AIR POLLUTANTS ON FARM ANIMALS. In: *Air Pollution Handbook*. Magill and Holden (eds.), New York, McGraw Hill, 1956, p. 8-1 to 8-12. 78 refs.

The acute and chronic effects of arsenic, fluorine, and lead on farm animals are reviewed. Symptoms, tolerances, pathological effects, and thresholds are discussed. The use of dusts or sprays of insecticides can cause poisoning of cattle. Fluorine in stack gas can contaminate vegetation; agricultural sprays and dust can also be a source of fluorine compounds. Cattle and sheep are the most susceptible to fluorine toxicosis of all farm animals, with pigs, horses, and poultry next in susceptibility. Lead compound; from industrial sources such as smelters and coal combustion, from dusts and sprays containing lead arsenate, and from automobile exhaust can pollute the environment and cause lead poisoning of animals. Chronic lead poisoning has occurred frequently on horses grazing near smelters, lead mines, and orchards which were sprayed.

1925

44636

APTIC NO. 67487

Reeves, George I.

THE ARSENICAL POISONING OF LIVESTOCK. *J. Econ. Entomol.*, vol. 18:83-89, Feb. 1925. 5 refs.

Feeding experiments, clinical observations, and autopsies concerning arsenic poisoning of livestock are reviewed. Experiments involving the administration of arsenic in the forms of arsenic trioxide, Fowler's solution, a flue dust containing 20% arsenic to various farm animals indicate that horses and cattle can tolerate, without any external evidence of injury or any discernible alteration upon postmortem examination, from 20-30 grains of arsenic per day over a period of months. Sheep, being comparatively small animals, are more easily poisoned, requiring only from 4-8 grains daily. The fatal dose for horses and cows is 300 grains. Arsenic poisoning is produced only by a large dose of the substance which is absorbed from the intestines into the circulation and attacks the liver. Effects of long-continued chronic arsenic poisoning are permanent, and the animal does not completely recover. The findings are discussed in relation to poisonings reportedly resulting from the spraying of alfalfa for the control of alfalfa weevil.

EFFECTS-MATERIALS

1974

44637

APTIC NO. 67679

Kentzler, O. and P. Hoff

BEHAVIOR OF A LARGE ALUMINUM ROOF DURING LONG EXPOSURE IN INDUSTRIAL ATMOSPHERE.

(Verhalten eines grossen Aluminiumdaches waehrend vieljaehriger Bewitterung in Industrielatmosphaere). Text in German. *Aluminium*, 50(8):530-532, Aug. 1974. 3 refs.

The corrosion behavior of a large aluminum roof made of aluminum-manganese alloy according to DIN 1725 for 21 years in a highly polluted industrial atmosphere was investigated in a follow-up study. The rate of dust fall averaged 1.3-2 g/sq m/day, and iron, silicon, magnesium, calcium, traces of sodium, titanium, chromium, copper, chlorides, sulfide, sulfate, and carbonate were found in the dust settled on the roof. Pitting and corrosion reaching depths of up to 0.1 mm were found during the first years of exposure, but the corrosion practically came to a halt after the first 5 to 10 years, and the roof, now 21 years old, is expected to remain in effective use for several more decades.

1973

44638

APTIC NO. 67737

Dreulle, N. and P. Dreulle

RELATIONSHIPS BETWEEN ENVIRONMENTAL POLLUTION AND THE CORROSION OF ZINC AND GALVANIZED STEEL. (Les relations entre la pollution de l'environnement et la corrosion du zinc et de l'acier galvanise). Text in French. *Corrosion (Rueil Malmaison Fr.)*, 21(2):114-119, March 1973. 10 refs.

The corrosion spelter and galvanized steel plates used as roofing materials by air pollutants in general, and sulfur dioxide in particulate was studied, and measures to be taken to abate corrosion are proposed. In atmosphere containing SO₂, zinc is corroded on its surface only through the formation first of insoluble zinc sulfite and then of water-soluble zinc sulfate. A relationship between the site of exposure, the atmospheric SO₂ concentration, and the rate of corrosion of zinc was established, and an increase in the rate of corrosion with relative humidity and in precipitation was determined. The rate of

EFFECTS-ECONOMIC

44643

corrosion of spelter amounts to about 10 microns per year which corresponds to a life expectancy of about 30 years in industrial polluted air. In urban air, the life expectancy amounts to about 100 years, well over one century in rural areas. The life of galvanized steel plates increases practically linearly with the thickness of the zinc coating. Painting was found highly efficient in abating the corrosion of spelter and galvanized steel.

EFFECTS-ECONOMIC

1974

44639

APTIC No. 67908

Bailey, Kenneth Charles

AIR QUALITY STANDARDS IN PERSPECTIVE, AN ECONOMIC ANALYSIS. *Combustion*, 46(5):23-27, Nov. 1974. 16 refs.

An economic analysis is presented of two Washington State agencies, the Puget Sound Air Pollution Control Agency and the Southwest Air Pollution Control Authority. Emphasis is placed on the failure of these agencies to discriminate particulate emission standards for different sized boiler plants. The economic and sociological ramifications of air pollution, the structure and goals of the two air pollution control agencies, the effects of homogeneous particulate emission standards which fail to discriminate for boiler size, and possible solutions to ameliorate the situation are discussed. The two agencies have set levels of particulate emissions which clearly ignore cost and benefits on the margin. Since the 1971 nationwide average particulate emission standard of 0.20 gr/scf allows no visible pollution and no discernable health hazards at 0.20 gr/scf, no external costs are being passed off onto others. Pollution abatement beyond the national average incurs incremental costs without increasing benefits (i.e., therefore, making society worse off). The abnegation of discriminating standards for different seasons of the year and different sized plants reflects agency indolence toward economic damage as the basis for emission standards. The standards ostensibly resulted from a leap frog effect, as Maryland and California decreased permissible levels in jumps. Particulate reductions beyond 0.2 gr/scf exceed the optimal emission level, thereby, making society worse off. Taxes might be a better method of reducing pollution than emission standards. (Author conclusions modified)

44640

APTIC No. 63663

Downing, Paul B.

THE COST AND EFFECTIVENESS OF RETROFIT PROGRAMS FOR USED CARS. *Water, Air, Soil Pollut.*, 3(1):91-105, March 1974. 17 refs.

Estimates are made of the cost and effectiveness of available retrofit pollution control devices. These estimates are used in a linear programming model to determine the combustion of devices applied to specific model year automobiles which will reach various specified emission reduction goals at least cost. The results are presented in terms of the South Coast Air Basin (Los Angeles) in 1975. A method of generalizing the results to other air basins is presented in an appendix. Estimates of control costs in the South Coast Air Basin are presented in a figure which shows the total annualized cost of control on the vertical axis and the mix of hydrocarbons and nitrogen oxides by percentage of the total amount controlled on the horizontal axis. At low reduction levels, a low cost point is found at about the 40%/60% HC/NOx mix and as reduction requirements increase, the low cost point shifts to the right reaching the 60%/40% HC/NOx mix at the higher levels of control. The range from the 57%/43% to the 77%/23% HC/NOx reduction mix represents the area of maximum attainable total reductions (68%). The cost increases as the level of control increases. An emphasis on NOx reductions dictates

a rapid increase in total control costs with increasing levels of control. An emphasis on HC reductions also dictates a rapid increase in control costs although the rate of increase is not as great as it is for NOx. The lowest rate of increase is approximately at a 60%/40% ratio of HC to NOx. If the assumption of equal % control of carbon monoxide and the sum of HC and NOx is relaxed, the maximum control technologically attainable through the use of retrofit devices is 68% CO removal and 82% removal of the total of HC and NOx with 64%/36% HC/NOx mix. (Author abstract modified)

44641

APTIC No. 67489

Faber, John H. and Allan W. Babcock

FLY ASH - JOINING THE RANKS OF NATURAL RESOURCES. *Resour. Recovery*, 1(3): 8-10, Sept./Oct. 1974.

Fifty million tons of fly ash from power plants were produced last year. If coal replaces scarce and costly oil in more utility plants, this tonnage will increase dramatically. Fly ash is not a wasted by-product, however, but can be used as a resource for building materials, soil stabilizers, and other profitable applications. Current programs using fly ash as a mineral resource are reviewed. Present fly ashes do not meet current specifications for many construction materials. The Federal Highway Administration recently recognized the situation and issued a memorandum directing highway officials to encourage substitution of fly ash for cement and as an agent for the stabilization of soils, subbases, and bases. The Federal Aviation Administration also changed its airport specification book to permit the construction of a base course using fly ash.

44642

APTIC No. 65844

Hartmann, W. D.

SOCIO ECONOMIC PROBLEMS OF ENVIRONMENTAL PROTECTION IN TECHNOLOGICAL DEVELOPMENT.

(*Sozioökonomische Probleme des Umweltschutzes bei der Entwicklung der Technik*). Text in German. *Technik (Berlin)*, 29(6):360-363, June 1974. 7 refs.

Socio-economic problems of environmental protection under the conditions of socialism are discussed. Unlike the narrow profit-mindedness in capitalism, the socialist relations of production will permit genuine harmonization of technological advancement with environmental concerns. To achieve effective environmental protection under the conditions of economic growth and technological advancement, environmental quality should be planned, the impact of production on the environment should be taken into account increasingly, and the principle of closed-cycle production with recovery and reuse of waste products should be promoted. Measures to be taken for environmental protection should lead to economically perceptible benefits, and therefore such measures should be stimulated by adequate economic incentives.

44643

APTIC No. 67629

Ohta, Tokio

ECONOMY AND THE KEY TECHNOLOGY OF THE CLEAN ENERGY-SYSTEM AS TO BE APPLIED IN JAPAN. *Bull. Fac. Eng., Yokohama Nat. Univ.*, vol. 23:163-174, March 1974. 18 refs.

Peculiarities of the energy economy in Japan are extracted to conclude that the stable petroleum supply which supports the present level of industry will be almost impossible to continue in the near future. To overcome the fuel shortage, a clean energy system is proposed. It is a cooperative system of the nuclear, solar, hydraulic, and geothermal energies with hydrogen and electric power; it is somewhat different from the hydrogen economy plan in the U. S. The sequential effects on domestic and national economies are discussed. The key technologies are the series-utilization of the heat flow from nuclear reactors and solar furnaces to simultaneously produce hydrogen gas and electric power. The clean energy system solves both the problem of the fuel shortage and the problem of pollution. (Author abstract modified)

44644

44644

Williams, J. R. and C. G. Justus

EVALUATION OF NATIONWIDE HEALTH COSTS OF AIR POLLUTION AND CIGARETTE SMOKING. *J. Air Pollution Control Assoc.*, 24(11):1063-1066, Nov. 1974. 15 refs.

Total nationwide health costs due to air pollution and cigarette smoking were evaluated by determining the percentages of the total respiratory disease cost for 1970 due to the separate and the synergistic effects of smoking and air pollution. Previous studies did not properly account for the well established synergistic effect of smoking and air pollution and assumed that the urban factor (ratio of urban incidence to rural incidence) was due primarily or exclusively to air pollution. Recent evidence strongly indicates that air pollution is not the primary cause of the urban factor, although it does make a contribution. Taking a minimum of 10% and a maximum of 50% of the urban factor to be due to air pollution, the total 1970 nationwide health cost due to air pollution was between \$62 million and 311 million, and the nationwide health cost due to cigarette smoking was \$4.23 billion. (Author abstract)

44645

APTIC NO. 67683

THE STATE OF POLLUTION MEASUREMENT EQUIPMENT MANUFACTURING INDUSTRY. (Kogai keisokuki sangyo no genjo). Text in Japanese. Kogai to Taisaku (*J. Pollution Control*), 10(9):93-103, Sept. 1974.

With the tightened application of pollution control standards, pollution measurement equipment manufacturing is developing as a new type of growth industry. The gross production of pollution measurement equipment is increasing yearly from \$25.6 million in 1967 to \$173 million in 1974 (estimation). The data on the production of pollution measurement equipment are compiled and analyzed in terms of the pollution control equipment investment, investment ratio for pollution measurement equipment, production of pollution control devices, production of pollution measurement equipment, distributions by the size of capital and number of employees, production by equipment type, manufacturer classification by equipment type, production and export by equipment type, and shipment by customer classification.

1973

44646

APTIC NO. 67925

Babcock, Lyndon R., Jr. and Niren L. Nagda

COST EFFECTIVENESS OF EMISSION CONTROL. *J. Air Pollution Control Assoc.*, 23(3):173-179, March 1973. 21 refs.

An emission control cost-effectiveness analysis is presented for the Environmental Protection Agency's program aimed at significantly improving the nation's air quality by 1976. Steam electric power plants, industrial boilers, and gasoline motor vehicles are identified as the largest sources of air pollution, accounting for 50% of the nation's total. Successful implementation of EPA policies would reduce nationwide pollution damages by 1976 to roughly 56% of the 1967 levels with an attractive cost/benefit ratio of only 0.39 (0.83 for industrial boilers, 0.31 for steam electric power plants, and 0.13 for gasoline motor vehicles). Projections beyond 1976 are less satisfying since continuing controls for new automobiles, costing almost \$4 billion/yr, would only reduce overall pollution levels an additional 10% at an uneconomic cost/benefit ratio of 1.6. Rather than stringent controls nationwide, more limited controls coupled with traffic management may be more desirable methods for reducing pollution levels in congested urban areas.

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AIR POLLUTION ABSTRACTS, FEBRUARY 1975

44647

APTIC NO. 70027

Cicchetti, Charles J.

ELECTRICITY GROWTH: ECONOMIC INCENTIVES AND ENVIRONMENTAL QUALITY. *Wisconsin Univ., Madison*, 47p., 1973 (?). 11 refs.

NTIS: N74-21687

The economic effects of imposing effluent charges or pollution taxes on electric utilities are discussed. Electric utilities are a major source of sulfur oxide pollution and may contribute more than all other polluters combined. Effluent charges encourage recycling and changes in the production processes of polluting firms because the environment will no longer be a free factor input. Rather than pay a sulfur tax, the utility companies will have incentives to invest in a capital intensive form of pollution control. The cost of this investment would be passed onto customers in a declining rate block fashion to take advantage of the different values of service of its various customers. Firms without a sulfur tax may prefer a fossil fuel fired plant over a nuclear plant. If the quality of service regulatory commissions are redefined, it should encourage utilities to meet the required environmental standards. If electric utilities have a fuel clause adjustment, they can pass on any change in the cost of the fuel used to generate electricity directly to consumers without a rate proceeding.

44648

APTIC NO. 67482

Just, James E.

IMPACTS OF NEW ENERGY TECHNOLOGY USING GENERALIZED INPUT-OUTPUT ANALYSIS (FINAL REPORT). *Massachusetts Inst. of Tech., Cambridge, Energy Lab., National Science Foundation, RANN Grant GI-32874, Rept. MIT-EL 73-1, 303p., Feb. 1973. 55 refs.*

NTIS: PB-226 139

Comparative economic and environmental impacts of high and low BTU coal gasification and the gas turbine topping cycle during the 1980-1985 time period were forecast. The forecast utilized a projected 1980 input-output table that was augmented by detailed air pollution coefficients and water, steel, and energy usage coefficients. Direct and indirect impacts of both investment in and operation of the new technologies were examined. Data was obtained from basic engineering studies of these processes and converted energy growth futures for 1985 were projected both with and without the new technologies. The high sensitivity of total capital investment and certain capital goods industries to the rate of energy use growth is indicated. High BTU coal gasification may aggravate the situation. (Author abstract modified)

44649

APTIC NO. 67790

Robson, F. L., A. S. Kesten, and R. D. Lessard

ANALYSIS OF JET ENGINE TEST CELL POLLUTION ABATEMENT METHODS. *United Aircraft Research Labs., East Hartford, Conn., Airforce Weapons Lab. Contract F29601-72-C-0049, Proj. 683 M, Subtask 3A07, AFWL-TR-73-18, 242p., May 1973. 119 refs.*

NTIS: AD-763 119

The economic effectiveness of current and projected exhaust gas treatment technology was assessed. Emission factor data for the most prevalent Air Force engines were gathered to determine the levels of pollutants. A theoretical model of a test cell augmentor tube with liquid injection was developed to aid in estimating total system flow rates as a function of engine operating parameters. Visible emissions can be reduced by the use of combustion additives. Particulate mass emission criteria as required by the Environmental Protection Agency can be met most economically by liquid scrubbing. Nearly all the carbon monoxide and unburned hydrocarbons would also be removed during the scrubbing process. One method to reduce nitrogen oxides emission involves nitric oxide oxidation followed by scrubbing to remove the nitrogen dioxide, CO, and hydrocarbons. A detailed engineering and cost analysis is

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needed for wet scrubbers, ozone injection, and liquid reclamation to estimate their cost effectiveness. (Author abstract modified)

44650

APTIC NO. 67689

Ralph M. Parsons GmbH, Frankfurt/Main (West Germany)

TECHNICAL AND ECONOMIC ASPECTS OF INCREASED DESULPHURISATION OF MIDDLE DISTILLATES. (Technische und wirtschaftliche Aspekte der weitergehenden Entschwefelung von Mitteldistillaten). Text in German. 24p., Spring 1973. 26 refs.

The feasibility of limiting the sulfur content of middle distillate fuels in Germany to levels in the range from 0.5-0.2 wt% is studied. Desulfurization to the lower level presents no problems of technology. Air pollution decreases and additional investment and operating costs associated with increased desulfurization are estimated for the period of 1972-1980 for Germany and other European Economic Community countries. Costs are based on models of national refining industries which consider crude oil imports, the size, the number, and the development of product demand. A reduction of the sulfur content in extra light fuel oil from the present 0.53% by weight to 0.3% by weight would reduce the sulfur dioxide concentration in the atmospheric layers close to the ground by about 27%. The determined costs for this further desulfurization will require price increases for the consumer which, however, will not exceed \$14/ton for a desulfurization to 0.3% and \$25/ton for desulfurization to 0.2% by weight.

1972

44651

APTIC NO. 63619

Ayres, Robert U.

SOCIAL AND ECONOMIC IMPLICATIONS OF LOW EMISSION VEHICLES. Society of Automotive Engineers, Inc., New York, Environmental Protection Agency, and Dept. of Transportation, Soc. Automotive Engrs. Int. Conf. Transp. Environ., Proc., Washington, D. C., 1972, Part I, p. 387-401. 7 refs. (May 31-June 2, Paper 720661.)

The basis for formulating so-called uniform emission standards for motor vehicles is examined. It is inconsistent with the widely accepted principle that the polluter should pay, if consideration is given to the problems caused by pollution rather than the sources of emissions. Atmospheric pollution problems are geographically limited and depend upon other variables such as the time of day and weather conditions. The major problems are associated with Southern California and other cities of the southwest, and congested urban areas. Emission standards should be flexible in order to reflect these environmental variations, and thus to achieve the maximum environmental improvement for the least total cost to vehicle owners and users. Several zoning schemes are discussed, having the common feature that cars meeting the most rigorous standards would be required only in zones having the greatest density of vehicles and population or the greatest propensity for smog formation. Such zones would probably be small enough in geographic extent to affect only a small fraction of the vehicles -- mainly taxis, delivery trucks, and central business district commuters -- at most 15% of the vehicles registered. Given the smaller number of vehicles involved, a fairly short (3 years) transition would probably be adequate. (Author abstract modified)

1971

44652

APTIC NO. 67546

Dienemann, Paul F. and Armando M. Lago

ENVIRONMENTAL AND SOCIAL COSTS IMPACTS OF NORTHEAST CORRIDOR TRANSPORTATION SYSTEM TECHNOLOGIES. Transp. Sci., 3(3):256-282, Aug. 1971. 25 refs.

Rational decision-making in the transportation sector cannot be undertaken without consideration of the important externalities or third party effects. The quantification of the incommensurable and imputed monetary value impacts of the transportation system technologies planned for the Northeast Corridor on noise, air pollution, aesthetics, safety, and air and highway congestion are presented. A final tableau of social benefits summarizes the imputed monetary values of incremental environmental and social impacts of the following modes -- high-speed rail, tracked air cushion vehicles, Short Take Off and Landing (STOL), and Vertical Take Off and Landing (VTOL) -- over the social costs of a 1975 base case composed of automobile, bus, conventional air, and the continuation of current demonstration rail projects. The magnitudes of environmental and external nonuser benefits are compared with the magnitudes of direct benefit categories represented by net revenues and values of users time savings. (Author abstract modified)

STANDARDS AND CRITERIA

1974

44653

APTIC NO. 67468

Heinen, Charles M.

WHO IS AFFECTED BY THE 1970 CLEAN AIR ACT AUTOMOTIVE STANDARDS. AIChE Symp. Ser., 70(137):8-11, 1974. 4 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 1972.)

The background and impact of the Clean Air Amendments of 1970 requiring a 90% reduction of automotive hydrocarbons and carbon monoxide based on 1970 emissions and a 90% reduction in nitrogen oxides based on 1971 model year emissions are reviewed in relation to possible control strategies for automobile emissions. Estimates of the economic penalties for achieving full 1976 standards are 30% for fuel and about \$300/car. It is generally agreed that the 1975-76 Federal standards cannot be met without the use of catalysts which have various problems such as temperature limitations and mechanical fragility. Current catalytic converters are capable of about 10-15,000 miles of service. Meeting NOx standards will require cooling the reaction of the combustion chamber by any of various methods, all of which will use more fuel. Using a rich mixture for NOx control will put extra stress on the oxidation catalyst used for hydrocarbon and carbon monoxide control.

44654

APTIC NO. 67638

Matsunami, Masahisa

EXHAUST GAS CONTROL REGULATIONS FOR USED CARS (HYDROCARBON CONTROL FOR GASOLINE CARS AND LPG CARS; BLACK SMOKE CONTROL FOR DIESEL CARS). (Shiyo kateisha ni taisuro haishutsu gasu kisei ni tsuite-gasorin sha mata wa LPG sha no tankasuiiso kisei; jizeru sha no kokuen kisei). Text in Japanese. Gijutsu Joho (Serv. News), 5(7):2-12, July 1974.

An explanation is given of the exhaust gas pollution regulations which will be put into effect on September 1, 1974, January 1, 1975, and April 1, 1975. Hydrocarbon emission must be controlled while the used cars are idling for those vehicles powered by gasoline or LPG. Used diesel cars must not emit excessively black smoke. New diesel cars must control the emission of nitrogen oxides, hydrocarbons, and carbon monoxide. Methods and procedures for taking the pollution measurements are discussed. Automobile maintenance businesses are urged to train men in the accurate taking of these measurements, in the accurate keeping of service records, and in the dissemination of information on these regulations.

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44655

APTIC NO. 67887

Ragone, David V.

EMISSION STANDARDS AND THE ENVIRONMENT.

SAE Australasia, 34(3):123-126, May/June 1974. 4 refs. (Presented at the Society of Automotive Engineers-Australia, National Convention, Nov. 1973, Paper 19.)

Problems relating to the establishment of emission standards are discussed. Difficulties can be traced to three types of uncertainty: in the health data required to set air quality standards; in the calculational methods used to determine emission limits; and in the technical, administrative, economic, and political feasibility of any proposed regulations. The existence of sufficient data to substantiate the threshold approach of the air quality standards as mandated by the Clean Air Amendments of 1970 is questionable, particularly in the case of nitrogen oxides. Emission standards are determined through the use of proportional rollback models which have severe limitations, but do have the advantage of producing answers quickly. The model implicitly assumes a linear improvement in air quality as emissions are decreased. This may be reasonable for carbon monoxide, but not for photochemical oxidants. The rollback model could lead to costly errors. Regulations should recognize the non-continuous nature of the relationship between emission levels and costs. Realistic and feasible penalties need to be developed to enforce conformance to regulations and schedules.

44656

APTIC NO. 67618

Japanese Society of Industrial Hygiene

ADVISES FOR MAXIMUM ALLOWABLE CONCENTRATION STANDARDS (1974). (Kyoyo nodoto no kankoku (1974)). Text in Japanese. Rodo Kagaku (J. Sci. Labour, Tokyo), 50(9):614-623, Sept. 1974.

The definition of industrial threshold limits or maximum allowable concentrations, the purpose of such advices and instructions for the application of maximum allowable concentrations are discussed. The maximum allowable concentration of 94 organic and inorganic substances, three categories of dust, and various types of asbestos dust are given. The measurement methods for three categories of dust are described with the range of particle size, selection of measuring point, calculation method for average concentration, and dust meters. The measurement methods for asbestos dust by the membrane filter method and X-ray diffraction method are also described. The definition of threshold standard for noise pollution, type of noise applicable, and application method of threshold standard are discussed. Also, the definition of threshold impact noise, type of applicable noise, and measurement method are described. The threshold high temperature is discussed from the standpoint of industrial hygiene with the definition of high temperature, temperature condition, physical exertion and exposure, and the threshold high temperatures also given.

44657

APTIC NO. 67622

Japan Environmental Agency, Bureau of Environmental Protection

THE ENFORCEMENT OF SULFUR OXIDE EMISSION STANDARDS. (So sankabutsu no haishutsu kijun no kyoka-to ni tsuite). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 30, p. 61-64, July 1974.

Measurements made in 1972 revealed that among 685 monitoring stations in 248 cities, 670 stations in 236 cities met the old environmental standard issued in Feb. 1969. However, 34% or 227 stations failed to meet the new standard revised in May 1973. The goal was to revise the old emission standard and to enforce the new emission standard so that all cities can meet the new environmental standard in 1977. The emission standard was established by investigating 120,000 facilities which omitted sulfur dioxide and taking the degree of air pollution and the growth of fuel consumption into consideration. As a general emission standard of the K value of polluted areas such as Tokyo, Yokohama, Kawasaki, Yokkaichi, Osaka, and

Amazaki was reduced from 6.42 to 3.50 and that of Chiba, Ichihara, Wakayama, Mizushima, and Kitakyushu was reduced from 7.59 to 4.67. The K value of another area was reduced from 22.2 to 17.5. The special areas were increased from 18 to 28 and the K values of these areas were reduced from 2.92, 3.50 and 5.26 to 1.17, 1.75 and 2.34, respectively.

LEGAL AND ADMINISTRATIVE

1974

44658

APTIC NO. 67654

Chapman, Duane

A SULFUR EMISSION TAX AND THE ELECTRIC UTILITY INDUSTRY. Energy Syst. Policy, 1(1):1-30, Fall 1974. 71 refs.

A sulfur emission tax is discussed as the most likely candidate for implementation from the general class of proposals characterized as pollution taxation. The results of an empirical analysis which utilizes an econometric model of demand and fuel substitution and an engineering model of production are reported. The conclusions which follow from the analysis are that emissions and damage would be significantly reduced, that there would be little effect on electricity demand growth and nuclear power growth, and that the sulfur emission tax assumes a greater value if the Clean Air Act is not implemented. Net benefits are positive in all cases, and the highest calculated net benefit to the nation is \$32 billion. The impact upon income groups is mixed. The reported inelastic income elasticities imply a regressive effect from tax-induced rate increases. However, other research has shown sulfur pollution to be concentrated among low-income urban areas. This indicates that reduction of sulfur emissions would benefit low-income groups disproportionately, and hence be progressive in this aspect. The study is qualified empirical support for a proposition which has long been preferred on theoretical grounds. (Author abstract)

44659

APTIC NO. 67946

Franzky, Hans

ENVIRONMENTAL PROTECTION IN EAST GERMANY. (Umweltschutz in der DDR). Text in German. Umwelthygiene, 25(10):217-219, Oct. 1974.

The latest environmentally related legislation in East Germany is surveyed. Recent legislative acts are concerned with water pollution, air pollution, noise control, and space planning in general. Industries generating air pollution are now required to take adequate steps to control emissions, and to integrate air pollution control measures in their plans. They are also legally required to pay damages arising from pollutant emissions.

44660

APTIC NO. 67888

Hager, J.

THE LICENSING PRACTICE FOR BRICK KILNS IN BAVARIA. (Aus der Genehmigungspraxis bei Ziegeleien im bayerischen Raum). Text in German. Gesundh.-Ing., 95(9):253-257, 1974. 40 refs. (Presented at the Second Symposium on Branch-specific Emissions, Fluorine Emissions by Brick Kilns, Munich, Germany, Feb. 1, 1974.)

Brick kilns emit hydrogen fluoride and other fluorine compounds. Injuries to vegetation in the vicinity of such plants have become increasingly known and are due to stacks being too low. Therefore brick kilns have been included in the list of industrial plants which require an operating license. Difficulties arose, however, because fluorine emissions from brick kilns are subject to considerable fluctuations which cannot be foreseen. Therefore a new licensing emission was adopted in which a limit concentration of 30 mg F/cu m in the waste gas referred to 3 vol% CO₂ is used. The procedure differs depend-

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ing on whether a stack exists or not. In the case of the existence of a stack, a limit value of the pollutant concentration is determined with the aid VDI (Verein Deutsche Ingenieure)-guideline 2289. In the case of the absence of a stack, a stack height calculation is performed using the mentioned limit value.

44661

APTIC NO. 67911

Heitner, Kenneth L. and James E. Krier

AN APPROACH TO AIR QUALITY MANAGEMENT STANDARDS. *J. Air Pollution Control Assoc.*, 24(11):1039-1043, Nov. 1974. 12 refs.

The Clean Air Amendments of 1970 impose a stringent set of uniform air quality standards and a rigid timetable for achieving them. Such an approach is open to serious question, since it fails to take account of variations in relevant local conditions. A proposal is given for a more realistic approach to air quality consisting of a program of management standards that would reflect the needs and circumstances of particular regions. An institutional framework is outlined that would consider the technical, economic, and social constraints that determine how quickly and how much any area can improve its air quality. The framework would provide the needed flexibility, and would employ a feedback approach that avoids the need to resolve all uncertainties before any progress can be made. At the same time, it would impose a timetable and planning process to assure that all feasible progress in air quality improvement is realized nationwide. An illustration of the management standards approach is given using Los Angeles as an example. (Author abstract modified)

44662

APTIC NO. 67531

Lauer, George and Ferris B. Benson

THE CHAMP AIR QUALITY MONITORING PROGRAM. Preprint, Rockwell International Science Center, Thousand Oaks, Calif. and Environmental Protection Agency, Research Triangle Park, N. C., EPA Contract 68-02-0758, 12p., 1974 (?)

The design and application of the Community Health Air Monitoring Program (CHAMP) are discussed. The system consists of 23 remote air quality monitoring stations located in five geographical areas within the United States, coupled to the central controller located at the EPA at Research Triangle Park, N. C. The sensors include aerometric pollutant analyzers, meteorological sensors, and a particulate sampling system which measure: nitrogen oxides, ozone, sulfur dioxide, hydrocarbons, peroxyacetyl nitrate, total suspended particulate, and size separated particulate. Also included in primary data are wind speed, wind direction, barometric pressure, relative humidity, and ambient temperature. A minicomputer is used as the primary logical element of the system and permits a highly flexible mode of operation.

44663

APTIC NO. 67934

Meyers, Sheldon

ENVIRONMENTAL IMPACT STATEMENTS AND OTHER ACTIONS IMPACTING ENVIRONMENT. AVAILABILITY OF AGENCY COMMENTS. *Federal Register*, 39(227):40976-40980, Nov. 22, 1974.

Federal agency actions impacting the environment are outlined in five appendices resulting from review and comments by the Environmental Protection Agency during the period of October 16, 1974 to October 31, 1974 pursuant to the requirements of section 102(2)(C) of the National Environmental Policy Act of 1969 and section 309 of the Clean Air Act, as amended. Appendix I contains a listing of draft environmental impact statements reviewed and commented upon in writing during the review period and includes the federal agency responsible for the statement, the number and title of the statement, the classification of the nature of EPA's comments, and the source for copies of the comments. Appendix II contains the definitions of the classifications of EPA's comments

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on the draft environmental impact statements, and the third appendix contains a listing of the final environmental impact statements reviewed and commented upon in writing during the reviewing period. Appendix IV contains a listing of proposed federal agency regulations, legislation proposed by federal agencies, and any other proposed actions reviewed and commented upon in writing pursuant to section 309(a) of the Clean Air Act during the reviewing period. The last appendix contains a listing of the names and addresses of the sources for copies of EPA comments.

44664

APTIC NO. 67597

Nishiyama, Iwao and Eijiro Sugano

RULES AND REGULATIONS OF AIR POLLUTION AND DEVELOPMENTS OF PAINTS AND ADHESIVES. (Taiki oson Kisei to kore ni tomonau torio oyobi setchakuzai no doko). Text in Japanese. *Hikaku Gijutsu (Leather Technol.)*, 16(1):32-47, Aug. 1974. 27 refs.

The status of air pollution regulations in Japan, detection and disposal methods for solvent vapor, and trends in the use of paints and adhesives in the leather goods industry are surveyed. As the leather industry becomes more automated and larger-scaled, more attention must be paid to the exhaust gas emissions and painting methods and equipment. Rule 66 of the Air Pollution Control District, Los Angeles County, United States, is summarized. Pollution regulations for Metropolitan Tokyo, Kanagawa Prefecture, and Osaka Metropolitan Prefecture are discussed. Detection methods for solvent vapors are presented involving chemical reactions, thermoelectric conductivity, contact combustion, and gas chromatography. Solvents may be disposed of by combustion, catalytic oxidation, adsorption, absorption. The history of paint usage in the leather industry and its contribution to air pollution are discussed. Future trends in paints include water-based and water-soluble paints, emulsions, nonaqueous dispersions, powder paints (thermoplastic and thermosetting resins), photo-hardening paints, and electron-hardening paints. Adhesives can be an emulsion type or a hot-melt type.

44665

APTIC NO. 67922

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. PROPOSED HEAVY-DUTY GASOLINE-POWERED VEHICLE RETROFIT REGULATION. *Federal Register*, 39(222):40306-40308, Nov. 15, 1974.

The Environmental Protection Agency is withdrawing a regulation regarding the control of carbon monoxide and photochemical oxidants (hydrocarbons) from heavy-duty gasoline-powered vehicles via limited delivery prohibition in connection with the New Jersey Transportation Control Plan and is proposing a regulation that will require the retrofit of heavy-duty gasoline-powered vehicles (gross vehicle weight greater than 10,000 lbs). A regulation is also proposed for annual inspection and maintenance which will ensure that the retrofit devices which are installed on the heavy-duty vehicles continue to operate correctly. Total reduction in emissions resulting from the proposed regulation is estimated to be 66.9%. Exact dates, times, and location of the public hearings on this proposal will be announced in the Federal Register and newspapers in the affected areas. Written comments on the proposal may be submitted on or before December 16, 1974.

44666

APTIC NO. 67936

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. PROPOSED NEW JERSEY ORGANIC MATERIAL REGULATION. *Federal Register*, 39(222):40308-40310, Nov. 15, 1974.

The Environmental Protection Agency is proposing a modification of regulation 52.1596 concerning volatile organic substances which was originally promulgated on November 13, 1973 and designed to control the use of organic solvents as

proposed by the New Jersey Transportation Control Plan in a manner modeled after the Los Angeles Air Pollution Control District Rule No. 66. The modification is proposed to reflect the technical information that was presented at comment period meetings by the National Paint and Coating Association, General Motors, Ford Motor Company, and other industrial companies; the revised regulation is based upon photochemical reactivity of hydrocarbons as defined in LAAPCD Rule No. 66. The revised proposal also allows the reformulation of paints and solvents as a method of control when the solvents come into contact with direct flame, as happens during baking in direct-fired ovens. Based on technical information presented at the comment meetings, the EPA proposes to exempt those paints and solvents that contain less than 30% by volume of volatile organic materials provided that the volatile organic fraction is not photochemically reactive as defined in the proposal. Comments are invited on whether the final compliance date should be 1975, 1976, or 1977 for the modified proposal.

44667

APTIC NO. 67660

Saito, Harumi

THE TOTAL EMISSION QUANTITY REGULATION FOR AIR POLLUTANTS—PARTIAL REVISION OF THE AIR POLLUTION CONTROL LAW. (*Taiki oson busshitsu no soryo kisei-taiki oson boshu no ichibu kaisei tsuite*). Text in Japanese. PPM (Japan), 5(9):14-19, Sept. 1974.

Sulfur dioxide environmental concentrations over the years at 17 monitoring stations in Tokyo, Kawasaki, Osaka, and Yokohama, show a sudden decrease of concentration and downward trend starting with 1969 when the new K-index calculation regulation of fuel and total emission was adopted. Numerically, the total average concentration decreased from 0.057 ppm in 1967 to 0.048 ppm in 1969, and further to 0.031 ppm in 1972. There were other factors that helped such as the development of fuel and stack gas desulfurization techniques, but the several enforcements of the K index over the years were probably the most immediate factor in the overall improvements. Thus, 98% of the total 248 cities of Japan passed the old environmental standard in 1969. With the new environmental standard established in May 1973, new SOx total emission regulation standards were set. Specific figures in the total quantity reduction plan are to be set locally by prefectural governors. Matters to be taken into consideration are the ratio of emission quantities by specially designated factories to the total allowable emission quantity in the entire area, the scales of factories and plants, the future figures for material and fuel consumption by designated factories, and the changes of emission conditions of sources other than designated factories. When an emission source fails to pass the regulation standard, according to the new law, the responsible party is to be penalized directly by less than six months incarceration or less than \$3300 fine.

44668

APTIC NO. 67591

Shinya, Kozo

THE STATE OF PHOTOCHEMICAL SMOG FORMATION IN JAPAN. (*Koizagaku sumoggu hassei no zenkokuteki jokyō*). Text in Japanese. *Kankyo Gijutsu* (Environ. Conserv. Eng.), 3(7):455-462, July 1974. 5 refs.

The status of photochemical smog pollution since the summer of 1970 (when the problem first received attention) is reviewed. Nitrogen oxide and hydrocarbon concentrations are increasing steadily with the steady increase in number of automobiles. Nationwide data (21 prefectures) are compiled on the oxidant pollution forecasting issued during the period of 1970-1973 according to the following four criteria: forecasting: oxidant concentration above 0.01 ppm; warning: above 0.15 ppm; alert: above 0.3 ppm; and emergency alert: above 0.5 ppm. The oxidant warning was issued only in the warm weather season of April to October, and particularly frequently in July and August. In the cold weather season, the oxidant concentration becomes higher on relatively warm days

with low wind velocity; however, the warning has never been issued. The oxidant alert was issued only once in 1973 in Osaka. The widespread warning days (the day warning was issued in more than eight prefectures) in 1973 were July 10 and August 10. The meteorological conditions on these days were analyzed in regard to the widespread oxidant pollution. The data on the number of complaints registered by afflicted people are compiled and analyzed.

44669

APTIC NO. 67559

Sorensen, Stefan, Ragnar Rylander, and Kenneth Berglund
INTERVIEWS AND MAILED QUESTIONNAIRES FOR THE EVALUATION OF ANNOYANCE REACTIONS.
Environ. Res., 8(2):166-170, Oct. 1974. 9 refs.

The results from mailed questionnaires and personal interviews were compared in assessing the extent of annoyance in communities exposed to different environmental agents. The investigation was performed in five urban areas exposed to aircraft noise, odors and refineries, general air pollution with a high level of dust, and in a control area. A slightly greater extent of annoyance due to particulate air pollution from industry and traffic was found with the questionnaire method in three out of five areas where a significant extent of annoyance was reported. The differences were not statistically significant. When odor from industry was evaluated, the interview technique gave a considerably larger extent of annoyance in two of the areas studied.

44670

APTIC NO. 67484

Stern, Arthur C. and Yuji Horie

INCORPORATION OF POPULATION EXPOSURE CONCEPTS IN AIR QUALITY CRITERIA DOCUMENTS.
Preprint, North Carolina Univ., Chapel Hill, Dept. of Environmental Sciences and Engineering, 12p., 1974 (?). 3 refs.

Short, intermediate, and long-term responses of human, vegetation, animal, and material populations are categorized with respect to the pollution concentrations and durations associated with them and are located as zones on arrowhead charts. In all charts the response curves stay put on the concentration duration axes, but the arrowhead charts moves up and down depending upon whether a community's air is polluted or not polluted. This is most apparent in the case of long term responses where in a nonpolluted community the long-term response zone can be completely above the maximum line of the arrowhead chart, or in a highly polluted community the response zone can completely engulf the arrowhead chart down to the minimum concentration line. The three major air pollution categories and three major response terms each need separate documentation in air quality criteria documents. (Author conclusions modified)

44671

APTIC NO. 67933

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NEBRASKA: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register*, 39(227):40951, Nov. 22, 1974.

Specific compliance schedules for stationary sources located in the Lincoln-Lancaster County Air Quality Control Region (State of Nebraska) are listed and proposed for approval by the Environmental Protection Agency Administrator pursuant to 40 CFR 51.8. Each approved revision establishes a new date by which the individual source must comply with the applicable emission limitation in the federally approved State Implementation Plan. In all cases, the schedules include incremental steps toward compliance with the applicable emission limitations. The applicable regulations, which are part of the Nebraska Implementation Plan, provide for the granting of variances for a period of six months; and the variances can be reviewed for good cause shown. The Environmental Protection Agency's approval of each compliance schedule will be uncon-

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ditional only as to the part of the schedule covered by the initial variance. Approval of the remainder of the schedule will be conditional upon the State's renewal of the variance in identical form and substance to that included in the schedule submitted to the EPA and approved herein.

44672

APTIC NO. 67935

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. KANSAS: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register*, 39(228):41177-41180, Nov. 25, 1974.

Compliance schedules adopted by the state of Kansas and submitted to the Environmental Protection Agency after notice and public hearings are proposed for approval by the Administrator and listed herein by source, location, regulation involved, date adopted, effective date, and final compliance date. Each approved revision establishes a new date by which the individual source (industrial and nonindustrial) must comply with the applicable emission limitation in the federally approved state implementation plan. In all cases, the schedules include incremental steps toward compliance with the applicable emission limitations. Copies of the compliance schedules and EPA evaluation reports are available for public inspection at the EPA office in Kansas City, Missouri.

44673

APTIC NO. 67937

Train, Russell E.

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. PENNSYLVANIA: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register*, 39(230):41363-41364, Nov. 27, 1974.

A listing of compliance schedules adopted by the Pennsylvania Bureau of Air Quality and Noise Control and submitted to the Environmental Protection Agency after notice and public hearing is provided for 19 stationary sources. Each source is listed according to location, regulation involved, date of adoption, effective date, and final compliance date. Evaluation reports have been prepared for each listed compliance schedule and are available for public inspection at the Region III Office in Philadelphia. The compliance schedules for the sources listed meet the requirements of 40 CFR 51.15.

44674

APTIC NO. 67520

Werczberger, Elia

LOCATIONAL ASPECTS OF AIR QUALITY POLICIES. Cornell Univ., Ithaca, N. Y., Center for Urban Development Research, Regional Science Dissertation and Monograph Series 2, Environmental Protection Agency Grant AP00842-02, 221p., 1974. 90 refs.

The spatial dimension of regional air quality policies is examined in terms of the long run pollution concentration. First, the general locational equilibrium is analyzed for the case when there is no government intervention in the market and the pollution costs incurred are proportional to the pollution level. The existence of the equilibrium is proved, and its properties are studied. Second, the air quality policy which minimizes joint total cost for all activities is investigated. The problem is non-convex, so that total cost minimization must be precluded for realistic situations. An air quality policy which seeks to maintain for each activity the appropriate air quality requirement is studied in the third part, and a mixed-integer programming model is developed which involves the definition of an air quality standard and a zoning regulation for each area. Decentralized implementation of the air quality standards can be achieved by a system of emission certificates or pollution licenses. The zoning requirements can be enforced by a system of penalties and incentives for the municipalities. Finally, the model is evaluated in a numerical example.

44675

APTIC NO. 67563

Yajima, Hiromi

POLLUTANT PURSUERS - STAFF MEMBERS OF THE TOKYO METROPOLITAN ENVIRONMENTAL PROTECTION RESEARCH INSTITUTE. (*Kogai no tsuisekishstachi-Tokyo Kogai Kenkyusho ni hataraku gunzo*). Text in Japanese. Ao to Midori (Blue Green), 3(7):52-65, July 1974.

The administrative background of pollution control in Tokyo Metropolitan Government and circumstances leading to the inauguration of the Tokyo Metropolitan Environmental Protection Research Institute are discussed. The organization of the Institute and functions of each department and section are described. Five key staff members were interviewed and their personal profiles and professional functions are given with the description of current projects.

44676

APTIC NO. 67615

Yamamura, Tsunetoshi

ENVIRONMENTAL ASSESSMENT IN UNPOLLUTED AREAS - ESPECIALLY FOR THE EASTERN AREA OF TOMAKOMAI. (*Miosen chiiki ni okeru kankyo asesumento -- Tomakomai kichi kaihatsu o chushin o shite*). Text in Japanese. Preprint, Japan Science Council, p. 41-42, 1974. (Presented at Domestic Symposium for International Environment Preservation Science Conference, 2nd, Tokyo, Japan, June 13-15, 1974.)

One problem in applying total emission regulation to the development plan of an unpolluted area is the implication that pollution up to the regulation level is permissible. The Tomakomai East industrial base is not an unpolluted area in the strict sense, since it is adjacent to the eastside of the existing Tomakomai industrial conglomerate. The status of environmental assessment and problems involved in the present environmental administration, basic administrative policies for environmental assessment, and the environmental assessment procedure employed by the Environmental Protection Agency are discussed. The progress in the environmental assessment for Tomakomai East development plan are reviewed pointing out the lack of environmental assessment data at the policy making stage, inadequacy of information, administrative procedural problems, and problems involved in administrative organization.

44677

APTIC NO. 67550

BELGIUM: LEGISLATION CONCERNING AIR POLLUTION. (*Belgique: La legislation concernant la pollution de l'atmosphere*). Text in French. Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), 27(367-369):326-328, June-July 1974.

Recent legislative actions taken in Belgium to abate air pollution are surveyed. Prohibition of well-defined forms of pollution, of certain equipment capable of generating undue pollution, and imposition of regulations on the use of equipment are the basic measures taken. Localization of emission sources, optimization of technological processes for air pollution abatement, emission and pollution monitoring, and the elaboration of emission and concentration standards are defined as priority actions. Special protection zones have been created. In these zones, the use of certain types of fuel is prohibited, and the fuel sulfur content is limited to 1% to limit the sulfur dioxide concentration in the air to 150 micrograms/cu m. Also, combustion equipment in such protection zones are subject to periodical inspections.

44678

APTIC NO. 67665

Japan Environmental Agency, Bureau of Environmental Protection

THE 1975 AUTOMOTIVE EMISSION GASES CONTROL REGULATIONS. (*Jidosha haishutsu gasu 50-nendo kisei ni tsuite*). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 30:3-15, July 1974.

The preliminary recommendations and the final bill passed on the Japanese version of the Munkie Law controlling the emission standards for automotive exhaust emission gases are presented and explained. The final bills were signed in January 1974 by the Japan Environmental Agency and the Ministry of Transportation. The new regulations will enforce the reduction of carbon monoxide emissions by 89%, hydrocarbons by 91%, and nitrogen oxides by 45% for regular automobiles; for light buses and light trucks, the reduction of CO by 29%, HC by 28%, and NOx by 17% will be enforced. These regulatory measures will probably achieve total CO emission level of 1966 by 1977, and the total HC emission level of about 1965 by 1977. The final standards are presented here in tables with their specific requirements for each automobile type, measurement methods, and maximum allowable emission standard for each pollutant. The 10-mode operation test required for determining the acceptability of an automobile is described with specific operation conditions for each mode and time requirement. Regulatory specifications and emission standards for newly manufactured automobiles of various types are also presented in tables. As control measures, emission gas recirculation, ignition time delay, catalytic oxidation, controlled vortex combustion chamber engines, rotary engines, and thermal reactors are suggested.

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APTIC NO. 67663

Campos Venuti, Gloria, Gianfranco Donelli, Luciano Maiami, Francesco Pocchiari, Ugo Sellerio, and Eugenio Tabet

HEALTH PROBLEMS IN SITE SELECTION OF POWER PLANTS. (*Riflessi sanitari dell'insediamento delle centrali termoelettriche*). Text in Italian. Ann. Ist. Super. Sanita (Rome), 9(2-3):79-101, 1973. 21 refs.

Health problems involved in siting conventional and nuclear power plants are discussed. Siting power plants requires preliminary studies on the distribution and activity of the population around the planned site, on the meteorological and microgeographic conditions, as well as on the preexisting pollution background. The health hazards due to sulfur dioxide and sulfuric acid mist, nitrogen oxides, carbon monoxide, and particulate emissions should be considered in selecting the site for thermal power plants. In thermal power plants located near urban areas, the use of low-sulfur fuel should be envisaged for periods of meteorologically unfavorable conditions.

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APTIC NO. 67414

Hausarath, Jack C.

A REGULATORY VIEWPOINT. Air Pollution Control Assoc., Pittsburgh, Pa., Niagara Frontier Section and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Council, Proc. Spec. Conf. User Fabr. Filtr. Equip., Buffalo, N. Y., 1973, p. 155-157. (Oct. 14-16.)

Local regulatory policy regarding bag filters is generally discussed. Local regulatory agency personnel serve their communities by policing pollution sources, but they are also available for guidance to these and other concerns plagued with emission control problems. They do not act as consultants, but from extensive practical experience, the agency and its field operators can offer the latest information on codes and provide critically important information in many areas of air pollution control technology. Considerable exposure to bag filter systems provides the Erie County Health Department with a measure of expertise in this area. (Author abstract modified)

44681

APTIC NO. 67668

Inoue, Rikita

THE PROBLEM OF TOTAL EMISSION REGULATION SYSTEM IN COMPLETELY CONTROLLED AREAS. (*Mizen boshhi chiki ni okeru soryo kisei hoshiki no mondaiten*). Text in Japanese. Preprint, Japan Science Council,

p. 30-32, 1973. (Presented at the Domestic Symposium for International Environment Preservation Science Conference, 1st, Tokyo, Japan, Nov. 8-10, 1973.)

The development of a new Tomohama East industrial conglomerate consisting of steel, petroleum, petrochemical, and non-iron metal industries in the area is being planned. The total emission control regulation system applicable to the new industrial development in general is discussed. Taking as an example of air pollution sulfur oxides pollution, the methodology and basic philosophy of total emission control regulation are described. The factors selected for environmental estimation (e.g., sulfur dioxide concentration), the statistical characteristics of SO₂, and the estimation of yearly average values are discussed. The application procedure for total emission control regulation involves the meteorological study on data for three preceding years, concentration calculation of yearly and daily averages and maximum concentrations, a survey on background concentration, preparation of model patterns based on the calculated values and target values, and the control planning for the achievement of environmental target values.

44682

APTIC NO. 67288

McGuire, Terry W. and Peter D. Venturini

REGULATING EMISSIONS FROM SERVICE STATION OPERATIONS - A VIEWPOINT. Preprint, State of California Air Resources Board, Div. of Implementation and Enforcement, Sp., Nov. 28, 1973. (Presented at the Vehicle Refueling Emissions Seminar, Anaheim, Calif., Dec. 4-5, 1973.)

The problem of hydrocarbon vapor emissions from service station operations in the state of California is reviewed, with particular attention to proposed regulation measures. Emissions of hydrocarbon vapors from service station operations in California amount to about 28.6 million gallons of gasoline, or 240 tons per day, with over 90% of these emissions occurring in air basins which include the state's major metropolitan areas (1972 figures). The emissions are a result of vehicle fueling losses and underground tank losses, with 50% of the losses attributed to the former. The state implementation plan contains the adoption of regulations requiring the recovery of vapors from gasoline marketing operations in the state's five most populous air basins, and the counties of Los Angeles, Orange, San Diego, and the Bay Area Air Pollution Control Districts have regulations requiring such recovery. Regulations for other areas of the state are also being proposed. Questions relating to the feasibility, cost, and effectiveness of various control methods, however, must be resolved before such regulations can be implemented.

44683

APTIC NO. 67664

Murata, Motohide

THE REGULATION OF TOTAL SULFUR OXIDES EMISSION IN MIE PREFECTURE. (*Chie-han ni okeru iousankabutsu no soryo kisei ni tsuite*). Text in Japanese. Preprint, Japan Science Council, p. 28-29, 1973. (Presented at the Domestic Symposium for International Environment Preservation Science Conference, 1st, Tokyo, Japan, Nov. 8-10, 1973.)

The environmental pollution in the Yokkaichi area is primarily due to the sulfur oxides emission from petroleum conglomerates. In spite of the increase in fuel consumption from 1,500,000 tons in 1962 to 3,800,000 tons in 1971, the amount of SOx emission has increased only from 74,000 tons to 96,000 tons. Presently, the SOx concentration is below the old environmental standard. However, the number of respiratory ailments is increasing, and a definite correlation is found between the number of ailments and environmental concentration of SOx. Total emission control regulation is being introduced at present. The methodology of total emission control regulation, its relationship to the new environmental standard and problems involved are discussed. The determination of total emission quantity of SOx for individual factories and

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control standards for sulfur content in fuels by the rank of fuel consumption are described. The assessment of the present pollution situation, determination of target values, and the relationship between the new environmental standard and target values are also discussed.

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APTIC NO. 67426

Ulrikson, G. U. and Emily D. Copenhaver

INFORMATION SYSTEMS IN ENVIRONMENTAL RESEARCH AND DECISION MAKING. *National Science Foundation-Research Applied to National Needs, Washington, D. C., Environmental Aspects of Trace Contaminants Program, Proc. Natl. Sci. Found. Trace Contam. Conf., 1st Annu., Oak Ridge, Tenn., 1973, p. 732-745. 23 refs. (Aug. 8-10.)*

NTIS: CONF-730802

To effectively maintain and disseminate information, information systems must be flexible enough to handle all types of data needed by their user communities. Whether providing bibliographic references, factual information, numerical data, or evaluated reviews, information systems and their products must be judged by the degree of usefulness to the users. Examples are given of several types of information systems such as those concerning bibliographic information, directories and inventories of current researchers and research projects, factual information files, numerical data files, and searchable

1972

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APTIC NO. 67886

Manheim, Marvin L. and John H. Suhrbier

COMMUNITY VALUES: A STRATEGY FOR PROJECT PLANNING. *Highway Res. Rec., no. 380:37-47, 1972. 3 refs.*

A proposed strategy for transportation project planning, location, and design, with emphasis on the approach to community values and other related social and environmental factors, is described. Five aspects of the strategy are discussed: the objective of the location-design process; the desired process dynamics and a recommended four-stage process strategy of initial survey, issue analysis, design and negotiation, and ratification; the principal roles, activities, and organizational structure implied for the team of individuals having responsibility for a project study; the dangers of the approach as perceived by a highway agency and a community; and the applicability of the approach to system (network) planning and other public policy problems. (Author abstract)

44686

APTIC NO. 67794

Sutton, R. M. D., C. Quadling, and Rita Laprade

INVENTORY OF POLLUTION-RELEVANT RESEARCH IN CANADA. 1972 INTERIM REPORT-VOLUME I - EXPERTISE. VOLUME II - PROJECTS. *National Research Council of Canada, Ottawa (Ontario), Environmental Secretariat Div. of Biological Sciences, Pub-BY72-1(ES), NRC-12678, CNR-12678, 346p., April 1972.*

A compilation of a survey on pollution relevant research in Canada is presented. Volume I contains a Canadian directory of pollution relevant expertise. The names, addresses, and general and particular interests of the contributors are listed. Volume II contains a Canadian directory of pollution relevant projects. Names, addresses, and the titles of projects with which the contributors are associated are listed. Both volumes contain a KWOC (keyword-out-of-context) index.

1971

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APTIC NO. 67508

Commission of the European Communities, Brussels (Belgium)
FIRST COMMUNICATION OF THE COMMISSION ABOUT THE COMMUNITY'S POLICY ON THE ENVIRONMENT. *29p., July 22, 1971.*

A communication by the Commission of the European Communities is presented on the whole field of environmental problems. The communication consists of a general statement of the Community's environmental problems, a general action program, and priority measures. Air pollutants earmarked for immediate action include: sulfur dioxide, suspended particulates, lead, photochemical oxidants, nitrogen oxides, carbon monoxide, and carcinogenic compounds, particularly hydrocarbons. The aim will be to establish a common methodology for studying these air pollutants, with a view to establishing basic levels for the Community. The Commission proposes to ascertain necessary pollution control measures, including their economic and commercial consequences, for the following industries in particular: the steel industry, the paper and pulp industry, the chemical and petrochemical industry, and the power generating industry. The Commission is also examining the feasibility of using rapidly degradable pesticides in place of some persistent ones, as well as the feasibility of employing biological control. Research coordinated at the Community level is also proposed.

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APTIC NO. 67522

Nineteen-Twenty Elizabeth II. Chapter 47

AN ACT RELATING TO AMBIENT AIR QUALITY AND TO THE CONTROL OF AIR POLLUTION. *p. 951-979, 1971.*

The Clean Air Act of Canada which relates to ambient air quality and to the control of air pollution is presented. The Minister of Fisheries and Forestry is responsible for collecting data through monitoring on air pollution and for establishing national ambient air quality objectives. The Governor in Council has the authority to prescribe national emission standards establishing the maximum quantities of pollutants that may be emitted from stationary sources and to publish national emission guidelines for pollutants emitted from all sources. The Governor in Council has the authority to make regulations relating to the composition of fuels and to forbid the production for use or sale of any fuels containing elements in violation of the regulations. Provisions are made for enforcing the regulations.

SOCIAL ASPECTS

1974

44689

APTIC NO. 67509

Wall, Geoffrey

COMPLAINTS CONCERNING AIR POLLUTION IN SHEFFIELD. *Area, 6(1):3-8, 1974. 6 refs.*

Complaints concerning air pollution received by the Sheffield Public Health Department are analyzed for possible relationships to pollution levels. Almost all of the complaints are concerned with very specific sources of pollution, as opposed to general pollution levels. The majority of complaints concern particulate pollution, with gaseous pollutants being largely overlooked. Spatial distribution of the complaints is uneven, with the majority coming from the central and northeastern part of the city, i.e., the industrial areas. The only socio-economic factors correlating significantly with complaint ratios are indices of crowding, with complaint ratios among the lower socio-economic groups reflecting more frequent exposure to factory emissions. Although most complaints come

from the worst polluted areas, there is no simple relationship between the number of complaints and ambient pollution concentrations.

1973

44690

APTIC NO. 67613

Hayashi, Satoru and Miyoko Hayashi

THE CONCEPTION OF TOLERANCE, ENVIRONMENTAL QUALITY STANDARDS, AND ENVIRONMENTAL ASSIMILATING CAPACITY. (Kyoyoryo gainen to kankyo kijun kankyo yoryo). Text in Japanese. Preprint, Japan Science Council, p. 35-37, 1973. (Presented at the Domestic Symposium for International Environment Preservation Science Conference, 1st, Tokyo, Japan, Nov. 8-10, 1973.)

With the increased interest in the need for total emission regulation, the social interest in measuring the quality of environment is shifting from the environmental quality standard to environmental assimilating capacity. The concepts of tolerance or permissible quantity in terms of the safety level (scientific tolerance) and compromise level (social tolerance) are evaluated in regard to chemical substances and radioactive substances. The definition of environmental quality standard and the establishment of the concept of collective exposure and affliction are discussed as well as the connotative dangers of the concept of environmental assimilating capacity. The future direction of pollution control regulation is also discussed based on the total emission regulation.

GENERAL

1974

44691

APTIC NO. 67755

Finklea, J. F., D. B. Turner, G. G. Akland, R. I. Larsen, V. Hasselblad, and S. D. Shearer

BRIEFING NOTES-A STATUS REPORT ON SULFUR OXIDES. Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 39p., April 1974.

Sulfur oxides emissions and their environmental effects are described. Fuels contain varying amounts of sulfur which is oxidized to sulfur dioxide or sulfur trioxide during combustion. These oxides are transformed into acid sulfate aerosols which can be transported in the atmosphere for long distances. These aerosols cause adverse effects on human health, vegetation, materials, and visibility. They are respiratory irritants because their small particle size allows deep penetration into the lung. Adverse effects on public health include aggravation of asthma, increases in deaths, and aggravations of illness among the elderly and infirm. Recent reductions of SO₂ emissions in major cities have not controlled urban sources of acid sulfate aerosols. Massive conversion of urban power plants to high sulfur fuels or unrestricted use of tall stacks and supplementa-

ry control systems can greatly aggravate the acid sulfate aerosol problem. Flue gas desulfurization, cleaner fuels, or modified combustion processes are required to control the acid sulfate aerosol problem. (Author summary modified)

44692

APTIC NO. 67766

Winterhalter, Johannes

ANNUAL SURVEY ENVIRONMENTAL PROTECTION (FIRST SEQUEL). (Jahresuebersicht Umweltschutz (I. Folge)). Text in German. Giesserei (Duesseldorf), 61(20):623-626, 1974. 25 refs.

A literature survey of articles on air pollution, solid waste disposal, noise abatement and water pollution published in the years 1973 and 1974 in German-language journals is given. A comparison of the total annual emission stemming from human activity with those stemming from natural processes shows that between 0.3 and 13% of the combined emissions stem from human activity. A table provides a survey on the solid, liquid and gaseous waste products from four-dries. Of the emitted air pollutants, carbon monoxide and dust rank highest. The extent of organic air pollutants emitted from foundries is still unknown. The toxic effects of major pollutants on humans and the environment are listed in two tables. For example, aldehydes, nitrore gases (nitrogen trioxide, nitrogen dioxide), ozone, and sulfur dioxide affect the lung. Arsenic, asbestos, cadmium, vanadium, polycyclic hydrocarbons, aromatic amines, epoxides, and N-nitrore compounds are carcinogenic. The aims of future environmental protection policy have been laid down in the Immission Protection Law of March 15, 1974. The law puts equal emphasis on prophylactic measures and abatement measures.

44693

APTIC NO. 67611

ENVIRONMENTAL PROTECTION. PART 5. (Kankyo hozen. Dai-5-hen). Text in Japanese. Kosei no Shihyo (Health Welfare Statistics), 21(9):214-234, 1974.

The changes in the living environment with regard to population growth, urbanization, and industrial development are discussed. The circumstances of establishing the Environmental Protection Agency and its organization and affiliation with other governmental agencies are outlined. Pollution control plans with definitions and legislative procedures and environmental assessment are also discussed. The pollution survey conducted by various governmental research laboratories, the National Pollution Research Center, and other independent enterprises are listed. The result of the nationwide survey on the effect of pollution on plants is summarized. The status of air pollution, environmental standards for sulfur dioxide, carbon monoxide, nitrogen dioxide and photochemical oxidant, and air pollution control and monitoring are reviewed as well as the status of water pollution and environmental standards for various water pollutants. The effect of pollution on human health, such as the case of Minamata-byo, Itai-itai-byo, PCB affliction and arsenic affliction, relief activities for victims, compensation regulation for victims and control laws concerning the production of chemicals are discussed. The status of noise, vibration, and malodor pollutions and their environmental standards are described.

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